

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appl. No	:	10/814,123	Confirmation No.	:	8039
Applicant	:	Zhang, et al.			
Filed	:	April 1, 2004			
Title	:	Protein Compatible Methods and Compounds for Controlling the Morphology and Shrinkage of Silica Derived from Polyol- Modified Silanes			
TC./A.U.	:	1712			
Examiner	:	Kuo Liang Peng			
Docket No.	:	3244-126 (Formerly 571-932)			

Honorable Commissioner for Patents  
P. O. Box 1450  
Alexandria, Virginia 22313-1450

Dear Sir:

**DECLARATION UNDER 37 CFR §1.132**

I, Michael A. Brook, a citizen of Canada, and resident of Ancaster, Ontario, Canada, declare that the following facts are within my knowledge and are true.

1. I reside at 165 Charterhouse Crescent, Ancaster, Ontario, Canada L9G 4M4.
2. I currently am a Professor in the Department of Chemistry, McMaster University, 1280 Main St. W., Hamilton, Ontario, Canada, L8S 4M1.
3. I have been working in the area of organic, polymer and materials synthesis utilizing silicon chemistry since 1980. My curriculum vitae is attached to this Declaration as Exhibit A.

4. I am an inventor, along with Zheng Zhang, Yang Chen, Jorge Cruz-Aguado, Richard J. Hodgson, Dina Tleugabulova and John D. Brennan, of the subject matter as claimed in U.S. Patent Application No. 10/814,123 filed April 4, 2004 (hereafter "the Application").

5. I have read and understood the disclosure and claims of the Application.

6. I have read and understood the Office Action that issued on the Application on May 17, 2006. The Examiner is of the view that claims 1-5, 8-10, 38, 40-45 and 47-48 are obvious over Nakanishi688 (US 5,009,688) in view of Gill (J. Am. Chem. Soc., (1998), 120, 8587-8598), claims 1-5, 8-10, 40-45, 47-52, 54-55 and 56 are obvious over Nakanishi875 (US 5,624,875) in view of Gill, claim 38 is obvious over Nakanishi875 in view of Gill and as evidenced by Barkin (US 3,374,103) and claims 53 and 57-61 are obvious over Nakanishi875 in view of Gill.

7. I have read and understood the claims that are attached to this Declaration as Exhibit B that I understand the Applicants are filing in response to the Office Action dated May 17, 2006. My comments below are based on the amended claims in Exhibit B (hereinafter "the amended claims").

8. The Applicants have developed a biomolecule compatible method of preparing bimodal siliceous materials having a meso/macroporous structure that is suitable for chromatographic applications by combining polyol-modified silane precursors with one or more water soluble polymers under conditions where a phase separation occurs before gelation, wherein said conditions comprise combining polyol-modified silane precursors with one or more water soluble polymers at a pH in the range of about 4 to about 11.5.

9. Nakanishi688 describes methods of preparing siliceous materials with controlled pore size by combining alkoxysilanes, or oligomers thereof, and a

water soluble polymer, under conditions where phase separation occurs before gelation. Nakanishi688 does **not** teach that the resulting materials are bimodal, i.e. that they have a meso/macroporous structure. The materials prepared using the method taught in Nakanishi688 are only described as “porous”.

10. Nakanishi875 describes methods of preparing siliceous materials with a bimodal meso/macroporous pore structure by combining alkoxysilanes, or oligomers thereof, and a water soluble polymer, under conditions where phase separation occurs at least concurrently with gelation, followed by treatment of the resulting gel with a matrix dissolving agent. Nakanishi875 does **not** teach that bimodal (i.e. meso/macroporous) silica materials can be obtained by hydrolyzing and condensing an alkoxysilane in the presence of a water soluble polymer. The bimodal structure is obtained **only** after treatment of the gel with a matrix dissolving agent.

11. Gill describes methods of entrapping biomolecules in siliceous materials prepared from oligomeric polyol silicates such as polyglyceryl silicate (PGS). PGS was prepared by the partial hydrolysis and condensation of tetramethyl orthosilicate (TMOS) to poly(methyl silicate) (PMS), followed by transesterification with glycerol, in a one pot reaction catalyzed by hydrochloric acid or poly(antimony(III) ethylene glycoxide). Specifically, at page 8595-8596, Gill describes the preparation of methyl/ethyl ester and polyol ester precursors as follows:

Poly(methyl silicate) (PMS) and poly(glyceryl silicate) (PGS): TEOS (0.48 mol) was mixed with ethanol (50 mL), and hydrochloric acid (10.4 mL of 0.25 M) was added over 30 min with vigorous stirring; then the mixture was heated to 70 °C for 15 h. Rotary evaporation at 35 °C provided PMS of composition  $\text{SiO}_{1.1-1.2}(\text{OMe})_{1.6-1.8}$  as a clear, viscous liquid. PGS was obtained by adding glycerol (0.38 mol) to the reaction mixture over 1 h, heating to 50 °C, and stirring for a further 40 h. [...] FAB-MS indicated that the product consisted mostly of glyceryl-bridged linear oligomeric polysilicates of DP 5-9.

Various glyceryl silicates ("SiGlc<sub>2-4</sub>") and poly(glyceryl silicates) ("SiO<sub>0.5-1.5</sub>-Glc<sub>0.5-2</sub>") were prepared by this method.

Gill utilizes Bronsted (HCl) or Lewis (poly(antimony(III) ethylene glycoxide)) acid catalysts and water to prepare PGS. Such conditions are ideal for alkoxysilane hydrolysis and, ultimately, condensation to prepare siloxane oligomers and polymers. Gill notes that DP 5-09 oligomers are formed. Thus, Gill prepares mixed alkoxy / siloxy species that he calls PGS. It is not possible to prepare pure alkoxysilanes in a medium containing water, such as hydrochloric acid, particularly when acidic catalysts are present (see C. J. Brinker and G. W. Scherer, **Sol-Gel Science - The Physics and Chemistry of Sol-Gel Processing**, New York, Academic Press, 1990 – p. 116 "Tetraalkoxysilanes, organotrialkoxysilanes, and diorganodialkoxysilanes hydrolyze upon exposure to water vapor"; "Hydrolysis is most rapid and complete when catalysts are employed."; "Many authors report that mineral acids are more effective catalysts...").

12. Diglyceryl silane (DGS) is an example of a polyol-modified silane precursor.

13. We have performed direct side-by-side comparison hydrolysis and condensation reactions of DGS, PGS and TEOS in the presence of polyethylene oxide (PEO, 10K MW) with or without added glycerol. Reactions were performed at pH 5.5 and at pH 11 which represent the ends of the pH ranges that are claimed in the application. The reaction conditions, with the exception of pH, are commensurate in scope with those taught in Nakanishi688 or Nakanishi875 in view of Gill. Experimental details and scanning electron microscopy (SEM) images of the resulting materials are presented as Exhibit C.

14. The results provided in Exhibit C show that the DGS samples 1, 5, 6 exhibit macroporosity and (not shown) mesoporosity. The morphology of the structures varies, but is in all cases open. Sample 2 is not macroporous. Under

these conditions, the gelation occurred prior to phase separation. In order to slow down gelation, one equivalent of glycerol was added while other conditions were kept constant. The retarded hydrolysis rate led to phase separation *prior* to gelation and a macroporous structure was achieved (sample 6). To more broadly show the effect of changing the rate, 1 equivalent of glycerol was added to all of DGS, TEOS and PGS reactions (samples 5, 6, 7, 8, 11 and 12). As can be clearly seen, under these conditions only DGS at either pH 5.5 or pH 11 led to macroporous structures, while TEOS and PGS did not. This demonstrates the significance of the pH ranges claimed in the application.

The SEM pictures of TEOS derived silica show that macroporous structures are not formed: with glycerol present, a 2 phase system results that does not cure within 1 day.

PGS does not lead to macroporous silica, irrespective of the presence of glycerol.

15. The experimental results show that DGS, used in the methods claimed by the present Applicants is fundamentally different from the material(s) prepared in Gill, Nakanishi688 and Nakanishi875. Specifically, in the presence of PEO (10K MW), DGS was the only precursor that provided macroporous material. Accordingly, DGS is not equivalent to PGS or TEOS. Further, in the presence of glycerol and PEO (10K MW) DGS was again the only precursor that provided macroporous material. Accordingly DGS is not equivalent to PGS plus glycerol or TEOS plus glycerol.

16. In summary, I believe that Applicants are entitled to claim a method of preparing bimodal siliceous material by combining polyol-modified silanes with one or more water soluble polymers under conditions where a phase separation occurs before gelation as specified in the amended claims. I am of the opinion that the amended claims are not obvious in view of Gill in combination with

Nakanishi688 or Nakanish875, since the substitution of DGS for the alkoxysilanes used in both of the Nakanishi patents would not be expected to provide the bimodal macro/mesoporous siliceous material that is obtained using the method of the present invention. This is substantiated by the fact that experiments performed in our own labs have demonstrated that PGS, when combined with a water soluble polymer in the method as claimed in the Applicants' application does **not** provide bimodal meso/macroporous siliceous material.

17. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statement and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the Application or patent resulting therefrom.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Michael A. Brook

EXHIBIT A

***Curriculum Vitae***

**Michael Adrian Brook**

**Address**

Home:

165 Charterhouse Cres.  
Ancaster, Ontario  
Canada, L9G 4M4.  
(905) 648-7361

Business:

Department of Chemistry  
McMaster University, ABB 459  
1280 Main St. W.  
Hamilton, Ontario  
Canada, L8S 4M1.  
(905) 525-9140 ext. 23483  
FAX (905)-522-2509  
E-mail: [mabrook@mcmaster.ca](mailto:mabrook@mcmaster.ca)

Web: [www.chemistry.mcmaster.ca/silicone](http://www.chemistry.mcmaster.ca/silicone)

**Personal Data**

Date of Birth: November 2, 1955  
Country of Birth: Canada  
Citizenship: Canadian  
Marital Status: Married, 3 children.

**Education**

ETH-Zürich (Swiss Federal Institute of Technology) 1984-85  
Postdoctoral Fellowship, Supervisor: Prof. Dr. D. Seebach

McGill University, Ph.D. (Dean's Honour List) 1983  
Supervisor: Prof. T.H. Chan (conferred 1984)  
Thesis: *The Trimethylsilyl Group in Organic Synthesis*

University of Toronto, Honours B.Sc. 1978  
Supervisor: Prof. M. Thompson, 4th year project  
Thesis: *The Oxidation Products of 8-hydroxyquinoline with Ceric Ammonium Nitrate*

University of Sussex, UK, Chemistry, first year 1974

### **Current Status at McMaster**

Professor of Chemistry, tenured.

Associate Member, Department of Pathology and Molecular Medicine (1993-2002).

Associate Member, Chemical Engineering (1999-2004).

### **Professional Organizations**

Member, Chemical Institute of Canada

Member, American Chemical Society

Member, McMaster Institute for Polymer Production Technology

Member, Brockhouse Institute for Materials Research (McMaster)

### **Employment History**

McMaster University, Professor (Promoted July 1997)	1997-
present	
McMaster University, Associate Professor (Promoted July 1991)	1991-97
McMaster University, Assistant Professor (Tenured July 1990)	1985-91
Prof. W.H. Rapson, University of Toronto	1979
<i>Determination of potential mutagenic products of the aqueous chlorination of wood pulp.</i>	
Dr. O. Merez, Ontario Ministry of the Environment	1978,
1977	
<i>Analysis of polycyclic aromatic hydrocarbons by capillary GC and HPLC.</i>	
Mr. T. Segeren, Chevron Asphalt, Calgary	1976
<i>Analysis of aqueous asphalt emulsions.</i>	

### **Consultancies**

Silicone Injection Molding Company, name withheld	2006
Biomaterials Company, name withheld	2005
Jenner and Block, Chicago	2005
Innovalight, St. Paul, MN	2004-
2005	
Inamed CA	2003-
2005	
Digital Persona	2004
Vision Company, name withheld	2003-
2004	
MDS-Sciex, Toronto	2003-
2004	
Dow Corning Corporation, Midland MI	2003-
2004	
Federal Government of Canada (Justice, Health)	2003,
2004	
Kent and McBride, Philadelphia	2003
GenoRx, CA	2003
Strategic Analysis International, Philadelphia	2003

Surtec, Valparaiso, ILL	2003
Eisenmann, Crystal Lake ILL	2002
Shook, Hardy and Bacon, Kansas City	2001-
2002	
Teltech (now Intota/Sopheon)	1993-
Stroock and Stroock and Lavan, New York	2001
Genencor, Palo Alto	2001
Sasol, Austin TX	2001
Arkmount Systems, Toronto	2000
Xantho, NC	2000
Gillette, Boston	2000
Shapiro, St. Paul MN	2000
Hatch and Associates, Shanghai	2000
General Electric, Waterford NY	2000
CalEnergy, Calipatria CA	2000
Ballard Power Inc., Vancouver	2000
Dow Corning Corporation, Midland MI	1990-
2000	
Jones Rogers, Toronto	1997-
2000	
Kent and McBride, Philadelphia	1999-
2001, 2003	
Trojan Technologies, London ON	1998-
2000	
CK Witco, Sistersville WV	1999
FEI Technologies, Princeton NJ	1999
Unilever, Port Sunlight UK	1997-98
Tel-Tek/Norsk Hydro, Porsgrunn Norway	1998
Strook and Strook and Lavan, NYC	1997
Eastman Chemical, Kingsport, Tennessee	1997
Albemarle Corp., Baton Rouge Louisiana	1996
Delphax, Mississauga ON	1996
Magnifoam, Barrie ON	1996-97
Lotek, Markham, ON	1995
Price Waterhouse, (for AMT), Toronto	1995
IVACS	1995
Itron, Waseca MN	1994
Trace Sciences	1993
Abitibi Price, Canada	1991-92
S&S Productions	1990
C.I.L. (now I.C.I. Canada)	1988
Galen Pharma (now Biovail, Trimel Lifesciences)	1988-90

### **Scholarly and Professional Activities**

ACS Award Committee, Member (specific award is confidential)	2005-
2010	
<i>Silicon Chemistry</i> (a journal), Regional Editor, The Americas,	2000-
Innovalight, St. Paul, MN, Scientific Advisory Board, Member	2004-
5th Polymerization in Dispersed Media, Lyon France (2004)	2003-4
Member, International Organizing Committee	
Scientific Advisory Board, Ian Wark Research Institute,	
Member, University of South Australia	2002-4
The 3rd International Workshop on Organosilicon Polymers (2003)	2002-3
Member, Organizing Committee, June 23-25, 2003; Rensselaer Polytechnic Institute, Troy, NY	
Formulation Days: Silicones and Fluorocarbons, Lyon France, Dec. 9, 10, 2002	
2002	
(Journées formulation silicones et fluorés), Member, Organizing Committee	
Perspectives on Silicon, Ian Wark Research Institute, Adelaide, July 15-19, 2002.	
Member, Advisory Board, University of South Australia	2002
Visiting Professor, Ian Wark Research Institute, University of South Australia	2002
Visiting Professor, Unité Mixte CNRS BioMérieux Lyon, France	2000
Visiting Scientist, Trojan Technologies, London Ontario	1999
<i>Can. J. Chem.</i> Special Issue in honour of Adrian Brook, (pub. Nov. 2000),	
Guest co-editor	1998-
2000	
XXX Organosilicon Symposium, Co-Chair	1997
Visiting Professor, Université de Bordeaux, Bordeaux, France	1996
Visiting Professor, Université Paul Sabatier, Toulouse, France	1996
Visiting Professor, University of Amsterdam	1992-93
74 <sup>th</sup> CIC Chemistry Conference	
Program Co-Chair	1990-91
Abstract Editor	1990-91
Symposium Organizer	1990-91
Conference Chairman, Southwestern Ontario	
Undergraduate Chemistry Conference	1987

### **Journal Referee (in order of frequency)**

- 1) *Silicon Chemistry*
- 2) *Journal of the American Chemical Society*
- 3) *Langmuir*
- 4) *Canadian Journal of Chemistry*
- 5) *Chemistry of Materials*
- 6) *Biomaterials*
- 7) *Organometallics*
- 8) *Organic Letters*
- 9) *Applied Surface Science*
- 10) *Journal of Polymer Science Part A: Polymer Chemistry*
- 11) *Applied Organometallic Chemistry*

- 12) J. Chem. Soc., Dalton Transactions
- 13) AIChE Journal
- 14) Science
- 15) Journal of Materials Chemistry
- 16) Artificial Organs
- 17) Journal of Inorganic Biochemistry
- 18) Australian Journal of Chemistry
- 19) Tetrahedron Letters
- 20) Journal of Organic Chemistry
- 21) Journal of Organometallic Chemistry
- 22) Synlett
- 23) Inorganica Chimica Acta
- 24) Chemische Berichte
- 25) Journal of Physical Organic Chemistry
- 26) Tetrahedron Computer Methodology

**External Grant Reviews (in order of frequency)**

- 1) NSERC Research Grants
- 2) NSERC Equipment Grants
- 3) Canadian Foundation for Innovation Review Chemistry Panel CFI Panel (Nov. 2001)
- 4) Canadian Institutes for Health Research grant review
- 5) NSERC Industrial Partnerships Program (CRD/IOR)
- 6) NSERC Strategic Grant
- 7) National Science Foundation (USA)
- 8) American Chemical Society, Petroleum Research Fund (PRF)
- 9) Killam Fellowship
- 10) US-Israel Binational Science Foundation

**Government Panels**

Expert Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, 2002  
Scientific Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, March 2005  
Expert Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, public panel, Sept. 2005

**Areas of Interest**

**Organosilicon Chemistry**

Silicon-biopolymer copolymers, Organofunctional silicones, Silica surface  
modification, Silicone Polymers,  
Protein entrapped in silica and silicones (immobilized enzymes), Silane coupling  
agents,  
Reactive Silicon Species

### Other Interests

Ocular Materials, Oral Vaccines, Functional Colloids, Synthesis of Novel Polymers, Synthetic Organic Chemistry

### Honours

Killam Fellowship (Canada Council of the Arts)	2003-2004
President's Award for Instruction (McMaster)	2003
McMaster Student's Union Teaching Award (Faculty of Science)	2002,
1997	
Invited Professor, Ian Wark Research Institute, University of South Australia	2002
Gold Key Honour Award, McMaster University	2000
Invited Professor, Unité Mixte CNRS BioMérieux Lyon	2000
Nomination for McMaster Students Association Teaching Award	2001,
1999	
	1998, 96,
94	
Synergy Award, Conference Board of Canada, NSERC	1996
with Mark R. McDermott and Connaught Laboratories, one of 4 annual Canada-wide awards	
(Award given for Industry-University collaboration)	
Invited Professor, Université de Bordeaux, Bordeaux, France	1996
Invited Professor, Université Paul Sabatier, Toulouse, France	1996
Invited Professor, Universiteit van Amsterdam, Netherlands	1992-93
Dutch National Science Foundation Foreign Researchers Award	1992-93
(NWO Bezoekersbeurs)	
IUPAC Travel Award	1991
Ichikizaki Travel Award for Young Chemists	1988,
1990	
NSERC Canada University Research Fellowship	1985-95
NSERC Canada Postdoctoral Fellowship	1984-85
NSERC Canada Postgraduate Scholarship	1979-83
T. Sterry Hunt Award (McGill)	1979-80
Society of Chemistry and Industry Gold Key	1978
Gollop Award in Chemistry (Toronto)	1978
S.H. Jane Silver Medal (Toronto)	1977
ACS Undergraduate Award in Analytical Chemistry	1977
Ontario Scholar	1974

### CO-WORKERS

#### M.Sc. students

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Lihua Liu	2004	Biopolymer modified silicones	
Lucy Ye (with Bob Pelton, Chemical Engineering)	2004	Bicompatible TiO <sub>2</sub>	

Hazem Amarne	2004	Boronates as structuring agents	
Weian Zhao	2004	Functional Colloids	
Dave Thompson	2003-05	Tethered nucleotides	
Sanela Martić	2003-05	<i>An Investigative Study of Silicon-Based</i>	M.Sc.,
Ph.D. Queen's		<i>Materials as Alternative Matrices for Maldi-Tof Applications</i>	
Kui Guo	2001-04	Protein in Sol Gel Silica	
Forrest (Li) Gan	2001-03	Silicone peptides	Ph.D.,
McMaster			
Cindy Liu	2001-03	Tris-Modified Silicone Surfactants and Their Angiotech Interactions with Proteins	Vancouver, Scientist
Paul Zelisko	1999-01	Silicone-protein copolymers	Ph.D.,
McMaster			
Amro Ragheb	1999-01	Anti-fouling coatings	Ph.D.,
McMaster			
David Valentini	1994-96	Scientist, Glaxo	
<i>The coupling of synthetic and biological polymers: silicone - starch composites</i>			
David Bayles	1994-96	<i>Towards an <math>\alpha</math>-silyl cation</i>	Ph.D.,
McMaster			
Grant Crowe	1992-94	<i>The <math>\beta</math>-effect of extracoordinate silanes</i>	Scientist,
Apotex			
Tom Stefanac	1992-94		Scientist,
Allelix			
<i>Silane based radical polymerization: functionalized homopolymers and copolymers</i>			
Mike Roth	1992-94		Scientist,
PMC Film			
<i>Controlled formation of new Si-based polymeric systems</i>			Tottenham, Ont.
Graham McGibbon	1989-91		Scientist,
Boeringer-			
<i>Gas phase measurements of the <math>\beta</math>-effect for vinyl cations</i>			Ingelheim, Montreal
Weifeng Yu	1988-91		Scientist,
EPA			
<i>The roles of ligands on silicon</i>			
Oakville			
Andrea Osterroth	1988-90	<i>Poly(methyl methacrylate) sterically stabilized with silicones</i>	(co-supervised with R..H. Pelton, Chemical Engineering)

Thomas Sebastian Zenon	1987-89	<i>Polytrichlorosilylstyrenes</i>	Scientist, Environ., MBA
Burl. ON Mahmud Hadi	1986-88	The $\beta$ -effect	

# **Ph.D. students**

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Dave Thompson	2005-	Silicone-modified saccharides	
Forrest (Li) Gan	2003-	Stereoselective reduction	
Elodie Pacard	2002-05	Colloidal Silica Aggregates Joint with Christian Pichot, ENS-Lyon France	
Amro Ragheb Poly(Ethylene Oxide)	2001-05	Controlling Protein-Silicone Interactions	With
Paul Zelisko	2001-05	Silicone-protein copolymers	
Masaaki Amako	2001-04	Organometallics in silicones	
Mustafa Mohamed	1996-01	<i>Surface modification by silane photolysis</i>	
Sonya Balduzzi	1995-01	<i>Functional silane and cobalt protecting groups</i>	
Ahmed Alzamly	1999-00	<i>Silicone-protein copolymers</i>	withdrawn
Frank Laronde	1995-00	<i>C<sub>2</sub>-symmetric Lewis acid catalysts: The role of imidazole in the stereoselective hydrosilylation of carbonyl compounds.</i>	Scientist MDS
Rodica Stan	1994-99	<i>Synthesis of novel organofunctional silicones and silanes for interface control</i>	Scientist, GE, WV
Vasiliki Bartzoka Taro Chem..	1994-99	<i>Silicone-protein interactions</i>	Scientist,
Mark Stradiotto	1995-99	<i>The dynamics and reactivity of <math>\eta^1</math>-indenyl complexes</i> (co-supervised with M. J. McGlinchey)	Asst.
Prof. Dalhousie Paul Charpentier	1993-97	Supported Metallocene Polymerization Catalysts PDF Duke (co-supervised with A. Hamielec, Chemical Engineering)	
Ralph Ruffolo	1992-97	<i>Silanes and allylsilanes as possible precursors for transition metal-stabilized silylium ions</i> supervised with M. J. McGlinchey	(co- M. Environment ON
Howard Ketelson	1992-96	<i>The colloidal stability and surface chemistry of Stöber silica</i> (co-supervised with R..H. Pelton, Chemical Scientist, Alcon	Engineering)

Courtney Henry Sheridan College	1990-94	Electrophilic additions, vinylsilanes	Prof.
Carol Dallaire MDS Laval	1988-92	<i>The <math>\beta</math>-effect for vinyl cations</i>	Scientist,
Melvin Farquharson	1985-86	Lewis Acids	Deceased

# **P.D.F.s**

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Rebecca Voß	2005		
Ferdinand Gonzaga	2003	Silicone surfactants	
Yan Gao	2003	Proteins in silica	
Dan Chen	2000-	Plasticized sol-gels	
Amro Ragheb	2005-	Fluorinated silicones	
Jian (Jack) Guo surfaces	2004-05		Biocompatible silicone
Zheng Zhang	2001-04 PDF, U. Washington		Proteins in silica
HongJian Tian	2001-04 PDF Waterloo		Contact lens cleaning
Hong Chen surfaces	2001-04 Assistant Prof.,		Protein compatible Wuhan University of Technology
Shouhai Gao	2001-01		Contact lens cleaning
Alexander Tseitlin Chemist, Toronto	1997-98	Wood-plastic composites	Research Siltech,
Gilles Sèbe Bordeaux	1996-97	Wood-polyolefin Composites	Assoc. Prof.,
Gang Hu	1995-97	Silicone Hydrophobes on Hydrophilic Polymers Superior Coatings	Ltd.
Winnipeg. Jianxiong Jiang Chengdu	1992-96	Silicone Rubbers	Scientist, Silicone Research Institute Asst. Prof.,
Christine Gottardo	1995-96	Lab Manager and Paper silanization Lakehead Univ.	

Christophe Le Roux Toulouse	1993-94	Radical Reactions of Hydrovinylsilanes,	CNRS,
C.-K. Yeom Membrane	1992-94	Pervaporation Membranes	Korean
Hari Gupta McMaster	1992-93	Silicone Membranes	Company PDF,
Pankaj Modi McMaster	1991-92	Oligosilylstyrenes, composite membranes	PDF
Wei Li China	1991-92	Membranes from silicones	Scientist,
T. Mancilla-Percino CINVESTAS	1990-91	$\beta$ -effect; Friedel-Crafts with ketones	Prof.
Stefan Müller BASF	1988-89	The $\beta$ -effect; Friedel-Crafts with ketones	Mexico City Scientist,  Germany.

#### Technicians

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Renita D'Souza	2004		
Kui Guo	2001	Silica Sol Gels	
Cindy Liu	2000	Chelating silicones	
Tom Stefanac student	1994	Recycling silicone	see M.Sc.
Chunfeng Guo	1991-3	Coupling reagents, glass coatings Parkhurst Knitwear	

#### Summer Students/In Course Students

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Aid Atlic	2005	Silicones by enzymes	
Amélie Burleraux	2005	Non-bleeding silicones	
Jill Ranger student	2003-5	Proteins and silicones	4 <sup>th</sup> year
N. Oakley	2004	Sterically bulky silicones	
S. Krakar	2004	Non-leaching silicone gels	
L. Tran	2004	Enantioselective reduction	
Meghan Marshall	2003-4	Western Blots of Proteins on Silicone (with H. Sheardown)	2003
Lisa Wilkinson Queen's	2003-4	Silica aggregation	4th year student

Lee Freiburger student	2003-4	Metallomesogen synthesis	3rd	year
Renita D'Souza	2002-4	Silica formulations (done in school year AND summer)		
Mike Hrynyk summer)	2002-4	Proteins in silicone rubber (done in school year AND summer)		
Joanne Poloczec student	2003	Borosilylation (with Steve Westcott, Mt. Allison)	3 <sup>rd</sup>	year
Stefanie Mortimer student	2003	Proteins on modified silica surfaces	4 <sup>th</sup>	year
Aoife O'Carroll student	2003		3 <sup>rd</sup>	year
Jonathan Schinkel Allison	2003	Metallomesogen synthesis	4 <sup>th</sup> year	student Mt.
Susan Jo student	2003	Drug delivery from silicone elastomers	2 <sup>nd</sup>	year
Cynthia Kwong summer)	2002-3	Cleaning contact lenses (done in school year AND summer)		
Ken Mak	2002-3	New silicone emulsions (done in school year)		
Allison Chapman	2002	Contact lens cleaning		
Stefanie Mortimer	2002	Proteins on modified silica surfaces		
Michele Riordon	2002	Silicone-protein conjugates		
Meaghan Walsh	2002	Sol-gel protein in silica		
Jannine Crowley	2001	Silicone Emulsions		
Meaghan Walsh	2001	Enzyme Emulsions		
Laveena Munshi School	2001	Chelating Silicones		Medical
Jannine Crowley	2000	Anti-fouling Coatings		
Ines Alonso Bilbao	2000	Silicones and Steric Stabilization		Ph.D.
Andre Lapierre Pittsburgh	2000	Enantioselective Reductions		Ph.D.
Krista Kerr	1999	Enantioselective ketone reduction		
Dino Alberico Guelph	1999	Thermoplastic elastomeric silicones		Ph.D.
Bryan Davies McMaster	1998	Chelating Silicones	3 <sup>rd</sup>	Year
Friedrika Becker Duisburg	1997	Ethylene Oxide Sterilization of Silicones		Ph.D.
Marko Baller	1997	Decouplable Coupling Agents.	Ph.D. Basel	
Bryan Davies McMaster	1997	Silicone Wood Composites	2 <sup>nd</sup>	Year
Stacey Bridges Student	1996	Wood-PE Composites		Grad.
Denny Lin Toronto	1995	Chiral tartrate silanes		M.Sc.

Herman Yang Computers	1994-96	DMSO for D <sub>3</sub> production	Quantum
Hanan Atala	1994-95	Amino acid derived surfactants	
Helen B. Penny	1992	Hydrosilanes	
Ralph Ruffolo Toronto	1992	Tartrate modified silicones	PDF
M. Tomaschewski BioChem.	1987	The $\beta$ -effect; Acylation	Scientist,  Thera.,
Laval Patricia Falletta CCIW	1986-87	Polysilylstyrenes	Scientist,
Jennifer Townsend Ont. Min.	1986	Polysilylstyrenes	Scientist,  of
Environment Axel Neuy Universität	1988-89	$\beta$ -effect	Ph.D.  Duisburg,
Germany Peter Hülser GmbH,	1985-86	The Silicon $\alpha$ - and $\beta$ -Effects	SurTec  Germany.

#### Fourth Year Project Students

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Stephanie Krakar	2004	Oligocarboxylate silicones	
Jill Ranger	2004	Surface bound nucleosides	
Stefanie Mortimer Carolina	2003	Heparin delivery	M.Sc., N.
Lauren Scott	2003	Antithrombogenic surfaces	M.Sc., UBC
Andy Cleaver	2000	Enantioselective Reductions	
Ines Alonso	1999	Silicones and Steric Stabilization	
Andre Lapierre	1999	Enantioselective Reductions	
Dwayne Stresman	1998	Siloxycarbenes (with J. Warkentin)	
Dino Alberico	1998	Cp-silicones, thermal crosslinking	
Gladys Chan school	1998	Protein-Silicone Latexes	Medical
Joerg Urschey	1997	Fluorescent Silicones	
Andrea Straatmann	1997	Water borne coupling agents	
Armin Schneider	1996	Hydrosilation catalysts	
		Diplomearbeit, Duisburg	
Jeff Kent	1996	Enzymes on Silicone Surfaces	

Alex Andronov Berkely	1995	Amphiphilic Polymers	M.Sc.
Hanan Atala	1995	Diels-Alder Based Coupling Agents	Ph.D.
Thomas Kuhnien Duisburg	1995	Inorganometallic Polymers	
Andrew Stadler	1994	Organommodified silicone colloids	Ph.D.
Jay Atanasoff	1994	Pt hydrosilation	
Chris Roos Frankfurt	1993	Silanone from thermal decomposition	
Dagmar Ulbrich Frankfurt,	1993	Pausen Khand Reactions Using Disilyl-dicobalt	Ph.D.
		Alkyne complexes	Germany
Jason Bernais	1993	Silicone-cellulose copolymers	MBA
Mike Roth	1991	see M.Sc. student	Ph.D.
Bjorn Ramacher Duisburg	1991	Tetrakis(trimethylsilylalkynylsilanes	
Rick Barker Pioneer	1990	Silicone stabilized colloids	Scientist,  Balloon,
Stoney Creek			
Ralf Jueschke Duisburg	1989	The $\beta$ -effect; Diastereoselectivity	Ph.D.
Bernhard Hladik Duisburg	1989	Silicone radical reactions	Ph.D.
Stefan Wenzel Duisburg	1990	Silylstyrene condensations	Ph.D.
Daniel Chau Corp.	1989	Slow release drugs	Newalta
Sean Guenette Ottawa	1988-89	Slow release drugs	Ph.D.
Axel Neuy Duisburg	1988-89	The $\beta$ -effect	Ph.D.
Christina Kremers Duisburg	1987-88	Silane polymers and chiral silaheterocycles	Ph.D.
Elizabeth Jefferson Toronto	1987-88	The $\beta$ -effect with Styrylsilanes	PDF,
George Elia	1986-87	Mechanism of Mukaiyama Reaction	Scientist,
Patricia Falletta CCIW	1986-87	Polysilylstyrenes,	
Peter Hülser GmbH,	1985-86	The Silicon $\alpha$ - and $\beta$ -Effect	SurTec  Germany.

**Research Funding**

**Applications (Type O= Operating, E = Equipment, I = Infrastructure, MI = Major Installation, C=Contract)**

<u>Applicants</u> <u>Year</u>	<u>Title of Project, Grantor</u>	<u>Type</u>	<u>Amount</u>
	<b>Biomimetic Intraocular Lens Surfaces for Minimization of Posterior Capsule Opacification, NSERC</b>	<b>CHRP</b>	
<i>Brook, M. A.</i> 2006 <i>Cappretta, A.</i>	HPFC Chromatograph, NSERC	E	29,604
<i>Brook, M. A.</i> 2006	GPC Chromatograph, NSERC	E	86,610
Sheardown, H.D. 2006-2010 Brook, M.A.,. CIHR (Brook portion, \$35K) West-Mays, J.	PDMS Based Keratoprosthesis In vitro and in vivo	O	142,500
Brook, M. A. 2006-11	Silicone Biocompatibility from Interfacial Control NSERC	O	115500

**Research Funding**

**Funding Held (Type O= Operating, E = Equipment, MI = Major Installation)**

<i>Brook, M.A.</i> 2006 <i>Ganachaud, F.</i>	Biocompatible, Thixotropic amphiphilic silicones as retinal tamponades, Ambassade de France (exchange Montpellier)	Travel	10,000
<i>Pelton, R.H.</i> 2006-10 Brook, M. A. 18 others	Sentinel: The Canadian Research Network on Bioactive Paper, NSERC, Brook portion 5%	O	10,000,000
<i>Brook, M. A.</i> 2005 <i>Sheardown, H.D.</i>	Intraocular lenses, AMO	Grant	157500
<i>Sheardown, H.D.</i> 2004-05 <i>Brook, M. A.</i>	PDMS – Hydrogel Interpenetrating Networks as Ophthalmic Biomaterials	I2I	125000

Brennan, J.D. 2004	Mercury Porosimeter for Characterization of	RT1(E) 88,419
Brook, M. A.	Macroporous Silicas, NSERC	
Brook, M. A. 2004	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (US 100000)	O 130000
Brook, M. A. 2004	Anti-fouling surfaces to reduce clotting (provided by J. Weitz, Hamilton Health Sciences	O 20000
Brook, M. A. 2003	Dow Corning Toray Silicones Silicone Liquid Crystals (M. Amako)	O 89000
Brash, J. 2003 +3 others	Gamma Counter, NSERC	E 39405
Brennan, J.D. 2003-6	Development of Mesoporous Monolithic Columns for	CRD 1.0 x10 <sup>6</sup>
Brook, M. A. Pinto, D. Volmer, D. Covey, T.	High Throughput Proteomics Applications NRC.NSERC, with MDS-Sciex BROOK PORTION (37%)	
Sheardown, H. 2003,4	PDMS Based Artificial Corneas – Cornea Epithelial	O 110000
Griffith, M. 2005	and Stromal Cell Interactions and Device Design	120000
Brook, M. A.	NSERC CHRP (40%)	
Sheardown, H. 2003-2006	Silicone Lenses for the Mitigation of Scarring	O 70000
Brook, M. A. Wong, D.	Following Corrective Laser Eye Surgery Materials & Manufacturing Ontario (Brook portion 40%)	
Brook, M. A. 2001-2005	Silicon at the Interface: Synthesis Directed to Interfacial Control, NSERC	O 74500
Brook, M. A. 2003	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (US 100000)	O 155000

Brook, M. A. 2002	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (\$US 80000)	O	120000
Brook, M. A. 2001-2002	Dow Corning Toray Silicones PhD Research Student Funding (M. Amako)	O	25000
Brook, M. A. 2001	International Collaborative Travel Grant, CIHR (+ living expenses in France up to 2 months paid by CNRS)		1600
Brook, M. A. 2001	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab.	O	90000
Brook, M. A. 2001	Protein-Containing Emulsions in Mucosal Immunology	O	84750
McDermott, M. 2002	NSERC CHRP.		89750
2003			84750
Organ, M. 2001-3	Accelerating Drug Discovery Using Frontal Affinity	CRD	1.6x106
Brook, M. A. Brennan, J.D. Schriemer, D. 2001-3	Chromatography/Mass Spectrometry, NSERC, with INH with MDS-Sciex BROOK PORTION		100000
McCarry, B. E. 2000	Biomolecular Interactions, Ontario Innovation Trust	MI	5,190,000
Brook, M. A. (16 others)			
McCarry, B. E. 2000	Biomolecular Interactions, CFI	MI	5,190,000
Brook, M. A. (16 others)			
Harrison, P. 2000	FT-IR System for <i>in-situ</i> Reaction Monitoring, NSERC	E	106145
Warkentin, J. McGlinchey, M. Brook, M. A. Berti, P.			

Valliant, J.F.

Brook, M.A. 2000	300 MHz CP-MAS NMR Spectrometer, NSERC	MI	336800
Harrison, P.H. Bain, A., Leigh, W.J. McGlinchey, M.J. Epand, R.; Valliant, J.F.			
Brook, M. A. 2000-2001	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Material & Manufacturing Ontario	O	40000
Pelton, R.H. 1999-2003	Calcium Carbonate Adhesion to Paper, Mintech Canada,	O	35840
Brook, M.A.	Grant-in-Aid (13 hours/month)		
Brook, M. A. 1999-2000	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Trojan Technologies Inc.	O	10000
Brook, M. A. 1999-2000	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Material & Manufacturing Ontario	O	70000
Pelton, R. H. 1999-2002	Calcium carbonate adhesion to paper, Mintech Canada	O	30,000
Brook, M. A.			
Brook, M. A. 1999	Silicone Spreading, Unilever Research	C	6500
Terlouw, J. K.. 1998	MS Infrastructure	I	498000
Brook, M. A. Bain, A. Stöver, H.			
Brook, M. A. 1998	Silicone Membranes, Tel-Tek Norsk Hydro	C	28000
Brook, M. A. 1998	Modifying Quartz Surfaces, Trojan Technologies	C	13462

Brook, M. A. 1998-2000	Dual Functionality Coupling Agents for the Fabrication of Wood-Plastic Composites, Material & Manufacturing Ontario	O	80000
Brook, M.A. 1997	Silicone sterilization with EO OCMR and Walsh Medical Devices	O	22000
Brook, M.A. 1997-2000	Functional Silane Coupling Agents : Grafting Incompatible Materials and Anchoring Transition Metals, NSERC Operating, 40 hr.	O	44000
Brook, M.A. 1997	Wood/Recycled Polyolefin Composites, OCMR	O	20000
Lott, J. 1996 Brook, M.A. (one of several major applicants)	Environmental Microscope, NSERC, Major installation	MI	633481
Kramer, J. M. 1996 Brook, M.A. Ford, D. Schwarz, H. Yang, D.	Molecular Modelling Software and Computer, NSERC	E	47710
Brook, M.A. 1996	Wood/Recycled Polyolefin Composites, OCMR	O	50000
Brook, M.A. 1994-6	Microparticle Delivery Systems for Immunogenic Agents, NSERC CRD Matching Funds	CRD	64500
Brook, M.A. 1995	Wood/Recycled Polyolefin Composites, OCMR	O	60000
Brook, M.A. 1995-96 Dickson, J. M.	Novel Membranes, Ontario-Singapore Technology (50% Brook)	O	92000
Brook, M.A. 1995-7 Pelton, R.	Silicone Modified Papers, MODO (50% Brook)	O	21000

Brook, M.A. 1995-6	Microparticle Delivery Systems for Immunogenic Agents, URIF Matching Funds, (50% Brook)	O	122000
McDermott, M. Underdown, B.			
Brook, M.A. 1994-6	Oral Immunization Delivery Systems, Connaught Laboratories (50% Brook)	O	120000
McDermott, M. Underdown, B.			
Brook, M.A. 1994	Dynamic Light Scattering Apparatus, NSERC,	E	105197
Pelton, R. Winnik, F., Stöver, H.			
Brook, M.A. 1994	Silicon based Polymerization Initiators, OCMR	O	35000
Brook, M.A. 1994	Oral Immunization Delivery Systems, Connaught Lab.	O	120000
Brook M.A. 1993-96	Stereocontrol and Silicon: Application to Organic and Polymer Synthesis, NSERC	O	31000
Brook, M.A. 1993-	Silicon based Polymerization Initiators, OCMR	O	20000
Stöver, H.D.H. 1992	Differential Scanning Calorimeter, Thermalgravimetric Analyzer, NSERC	E	71559
Brook, M.A. 1991	Oligosilylstyrenes as Glass Coating Materials, OCMR	O	15500
Brook, M.A. 1990-92	Pervaporative Membranes, URIF Matching Funds	O	57000
Dickson, J.	(50% Brook)		
Brook, M.A. 1990-92	Pervaporative Membranes, NSERC CRD Matching Funds	O	54000
Dickson, J.	(50% Brook)		
Brook, M.A. 1990-92	Pervaporative Membranes, ICST	O	45000

Dickson, J.	(50% Brook)		
Brook, M.A. 1990-92	Organosilicon compounds: From the $\beta$ -effect to Polymers, NSERC	O	30000
Brook, M.A.	Polymers, OCMRO	4500	1989
Brook, M.A. 1989	Silicone Polymers, Dow Corning	O	6500
Brook, M.A. 1989	Gel Permeation Chromatograph, NSERC	E	54260
Brook, M.A. 1988	Sterically Stabilized Particles, Xerox	O	5000
Pelton, R.	(50% Brook)		
Brook, M.A. 1988	Glycol-Silicone Polymers, J.P. Bickell Foundation	O	12500
Brook, M.A. 1988-89	Chiral Manifolds & Lewis Acids: Organosilane & Titanium Compounds, NSERC	O	30000
Brook, M.A. 1988	Oligotrihalosilylstyrenes: & Polymer Blending Agents OCMR	O	12500
Brook, M.A. 1987-90	Polysilylstyrenes, MIPPT	O	5000
Brook, M.A. 1987 Falletta, P.	Silicone Coating Materials, SEED (E + IC)	O	2600
Brook, M.A. 1987	Organosilicon Compounds Bearing Chiral Ligands: Synthetic Applications NATO	O	2500
Brook, M.A. 1987	Lewis Acids in Enantioselective Organic Synthesis McMaster University	O	13000

Brook, M.A. 1986	Polysilylstyrenes, MIPPT	O	2000
Brook, M.A. 1985-87	The Application of the Trifluorosilyl Group to Organic Synthesis NSERC	O	17280
Brook, M.A. 1985	Lewis Acids in Organic Synthesis, McMaster University	O	15000

**Lifetime Publications (Green – undergraduates; Red = graduate students; BLUE = PDFs)**

**Peer Reviewed**

**(a) Books**

- 1 B **BROOK, M. A. *SILICON IN ORGANIC, ORGANOMETALLIC AND POLYMER CHEMISTRY*, WILEY: NEW YORK, 2000, 608 pages, (704 including tables, and indices, SOLE AUTHOR).**

**(b) Contributions to Books**

6. F M. Liu, A. Ragheb, P. Zelisko, and M. A. Brook, *Preparation and Application of Silicone Emulsions Using Biopolymers*, In *Colloidal Biomolecules, Biomaterials, and Biomedical Applications* (Surfactant Science, Vol. 116), Elaïssari, Abdelhamid, Ed.; Mercel Dekker Inc., 2004, Chapter 11, pages-309-329, invited manuscript.
5. N Laronde, F.; Brook, M. A. *Amino acid catalysts for the enantioselective hydrosilane reduction of carbonyl groups*, In *Catalysts for the Fine Chemical Synthesis, Vol. 1, Hydrolysis, Oxidation and Reduction*, Roberts, Stan M.; Poignant, G., Eds., 2002, pp. 169-172.
4. F Bartzoka, V.; McDermott, M. R.; Brook, M. A., *Protein-Silicone Interactions at Liquid/Liquid Interfaces*, In *Emulsions, Foams and Thin Films*, Mittal, K. L.; Kumar, P., Eds., Dekker, New York, 2000, Chap. 21, pp. 371-380, Invited manuscript.
3. R Adrian G. Brook and Michael A. Brook, *The Chemistry of Silenes*, *Adv. Organomet. Chem.*, **1996**, 39, 71-158.
2. R Michael A. Brook, *1,2-bis-(Trimethylsilyloxy)cyclohexene*, in *Encyclopaedia of Reagents in Organic Synthesis*, L. Paquette, Ed., John Wiley and Sons, Vol 1, 1995, p. 602, invited manuscript.
1. R Michael A. Brook, *tert-Butyl  $\alpha$ -chloro- $\alpha$ -trimethylsilylacetate*, in *Encyclopaedia of Reagents in Organic Synthesis*, L. Paquette, Ed., John Wiley and Sons, Vol. 2, 1995, p. 862, invited manuscript.

**(c) Journal Articles (C = communication, N = Note, F = Full paper, R = Review)**

128. C Ferdinand Gonzaga and Michael A. Brook, *Structured Nanoparticles in Silicone Surfactant Multilayers*, *Angew. Chem. Int. Ed.*, submitted 11/8/2005

# Accepted for Publication

132. C Weian Zhao, Yan Gao, Srinivas A. Kandadai, Michael A. Brook\* and Yingfu Li. *DNA Polymerization on Gold Nanoparticles via Rolling Circle Amplification: Towards Novel Scaffolds for Three-Dimensional Periodical Nanoassembly*, accepted *Angew. Chem. Ed. Engl.* Jan 2006.
131. F Elodie Pacard, Michael A. Brook, Amro M. Ragheb, Christian Pichot and Carole Chaix, *Elaboration of silica colloid/polymer hybrid support for oligonucleotide synthesis*, *Colloids Surf. B: Biointerfaces*, accepted, Dec. 2005.
130. F Chen, H., Brook, M. A., Sheardown, H. D., Chen, Y., Klenkler, B. A *Generic Bioaffinity Surfaces*, accepted *Bioconjugate Chemistry* Nov 2005 (ACS ASAP CODEN: BCCHES ISSN:1043-1802. AN 2005:1345621).

# Publications

129. F Hodgson, Richard J.; Besanger, Travis R.; Brook, Michael A.; Brennan, John D. *Inhibitor Screening Using Immobilized Enzyme Reactor Chromatography/Mass Spectrometry*. *Anal. Chem.* **2005**, 77, 7512-7519.
128. Liang, L.; Dickson, J. M.; Zhu, Z.; Jiang, J.; Brook, M. A., *Removal of 1,2-dichloroethane from aqueous solutions with novel composite polydimethylsiloxane pervaporation membranes*. *J. Appl. Polym. Sci.* **2005**, 98, 1477-1491.
127. F Chen, H.; Chen, Y.; Sheardown, H.; Brook, M. A. *Immobilization of heparin on a silicone surface through a PEG spacer*, *Biomaterials*, **2005**, 26, 7418-1724.
126. C Ragheb, A. M.; Brook, M. A. *Highly stable chymotrypsin entrapped in silicone elastomers*, *Biomaterials* **2005**, 26, 6973-6983.
125. F Yang Chen, Zheng Zhang, Xihua Sui, John D. Brennan and Michael A. Brook, *Reduced Shrinkage of Sol-Gel Derived Silica Using Sugar-based Silsesquioxane Precursors*, *J. Mater. Chem.* **2005**, 15, 3132 – 3141.
124. F Hodgson, Richard J.; Brook, Michael A.; Brennan, John D., *Capillary-Scale Monolithic Immunoaffinity Columns for Immunoextraction with In-Line Laser-Induced Fluorescence Detection*. *Anal. Chem.* **2005**, 77, 4404-4412
123. F Dong, Hanjiang; Brook, Michael A.; Brennan, John D., *A New Route to Monolithic Methylsilsesquioxanes: Gelation Behavior of Methyltrimethoxysilane and Morphology of Resulting Methylsilsesquioxanes under One-Step and Two-Step Processing*, *Chem. Mater.* **2005**, 17, 2807-2816.
122. F Sonya Balduzzi, Michael A. Brook and Michael J. McGlinchey, *Diastereoselective Addition of Allyl- and Crotylstannanes to Dicobalt-Complexed Acetylenic Aldehyde*, *Organometallics* **2005**, 24, 2617-2627.
121. F Kovarik, Peter; Hodgson, Richard J.; Covey, Tom; Brook, Michael A.; Brennan, John D. *Capillary-Scale Frontal Affinity Chromatography/MALDI Tandem Mass Spectrometry Using Protein-Doped Monolithic Silica Columns*, *Anal. Chem.* **2005**, 77, 3340-3350.

120. F Masaaki Amako, Jonathan Schinkel, Michael A. Brook, Michael J. McGlinchey and James F. Britten, *Rac/meso Transformations of Disiloxane-bis(1-indenyl)-ansa-ferrocenes: An x-ray Crystallographic and NMR Study*, *Organometallics*, **2005**, 24, 1533-1543.119. F. Xihua Sui, Jorge A. Cruz-Aguado, Yang Chen, Zheng Zhang, Michael A. Brook and John D. Brennan, *Properties of Human Serum Albumin Entrapped in Sol-Gel-Derived Silica Bearing Covalently Tethered Sugars*, *Chem. Mater.* **2005**, 17, 1174-1182.
118. F Hong Chen, Michael A. Brook, Yang Chen, and Heather Sheardown, Surface properties of PEO-silicone composites: reducing protein adsorption *J. Biomaterials Sci., Polym. Ed.*, **2005**, 16, 531-548.
117. F Hong Chen, Zheng Zhang, Yang Chen, Michael A. Brook, Heather Sheardown, Protein Repellant Silicone Surfaces by Covalent Immobilization of Poly(Ethylene Oxide), *Biomaterials*, **2005**, 26, 2391-2399.
116. F Amro Ragheb, Michael A. Brook and Michael Hrynyk, *Highly active, lipase silicone composites*, *Biomaterials*, **2005**, 26, 1653-1664.
115. F. Masaaki Amako, Jonathan Schinkel, Lee Freiburger and Michael A. Brook, *Silicone Compatible, Siloxane-Supported Organometallic Compounds and Their Catalytic Activities for the Hydrosilylation of Vinylsilanes and Dienes*, *J. Chem. Soc., Dalton Trans.*, **2005**, 74 – 81.
114. F Michael A. Brook, Yang Chen, Kui Guo, Zheng Zhang and John D. Brennan, *Sugar-Modified Silanes: Precursors for Silica Monoliths*, *J. Sol. Gel. Sci. Technol.* **2004**, 31, 343-348.
113. F Dina Tleugabulova, Andy M. Duft, Zheng Zhang, Yang Chen, Michael A. Brook and John D. Brennan, *Evaluating Growth Mechanisms of Silica Particles using Fluorescence Anisotropy Decay Analysis*, *Langmuir* **2004**, 20(14), 5924-5932.
112. F Cruz-Aguado, Jorge A.; Chen, Yang; Zhang, Zheng; Brook, Michael A.; Brennan, John D. *Entrapment of Src Protein Tyrosine Kinase in Sugar-Modified Silica*. *Anal. Chem.* **2004**, 76(14), 4182-4188.
111. F Jorge A. Cruz-Aguado, Yang Chen, Zheng Zhang, Nadine H. Elowe, Michael A. Brook and John D. Brennan, *Ultrasensitive ATP Detection Using Firefly Luciferase Entrapped in Sugar-Modified Sol-Gel Derived Silica*, *J. Am. Chem. Soc.* **2004**, 126, 6878-6879.
110. F R. J. Hodgson, Y. Chen, Z. Zhang, D. Tleugabulova, H. Long, X. Zhao, M. Organ, M. A. Brook, J. D. Brennan, *Protein-Doped Monolithic Silica Columns for Capillary Liquid Chromatography Prepared by the Sol-Gel Method: Applications to Frontal Affinity Chromatography*, *Anal. Chem.* **2004**, 76, 2780-2790.
109. F Liang, Liang; Dickson, James M.; Jiang, Jianxiong; Brook, Michael A. *Pervaporation of 1,2-dimethoxyethane from aqueous solutions by crosslinked oligosilylstyrene-poly(dimethylsiloxane) composite membranes*. *J. Appl. Poly. Sci.* **2004**, 92, 2284-2294.
108. F Liang, Liang; Dickson, James M.; Jiang, Jianxiong; Brook, Michael A. *Effect of low flow rate on pervaporation of 1,2-dichloroethane with novel*

- polydimethylsiloxane composite membranes. J. Membrane Sci.* **2004**, 231(1-2), 71-79.
107. F Michael A. Brook, Yang Chen, Kui Guo, Zheng Zhang and John D. Brennan, Sugar-Modified Silanes: Precursors for Silica Monoliths, *J. Mater. Chem.* **2004**, 14, 1469 – 1479.
  106. F Dina Tleugabulova, Zheng Zhang, Yang Chen, Michael A. Brook and John D. Brennan Fluorescence Anisotropy in Studies of Solute Interactions with Covalently Modified Colloidal Silica Nanoparticles, *Langmuir* **2004**, 20, 848-854.
  105. F Michael A. Brook, Hong Chen and Heather Sheardown, Silicone elastomers for reduced protein adsorption, *Biomaterials*, **2004**, 25, 2273-2282.
  104. F Frank J. LaRonde and Michael A. Brook, *Allylation of aldehydes catalyzed by chiral N,N'-bis(N-methyl-2-methylene-4,5-bisphenyl-imidazole)-1,2-cyclohexane diamine rhodium (III) complexes*, *Can. J. Chem.* **2003**, 81, 1206-1212, issue dedicated to John Harrod, invited manuscript.
  103. F Amro Ragheb, Michael A. Brook and Michael Hrynyk, *Highly activated, silicone entrapped, lipase*, *Chem. Commun.*, **2003**, 2314–2315.
  102. F Travis R. Besanger, Yang Chen, Anil K. Deisingh, Richard Hodgson, Wen Jin, Stanislas Mayer, Michael A. Brook and John D. Brennan, *Screening of Inhibitors using Enzymes Entrapped in Sol-Gel Derived Materials*, *Anal. Chem.* **2003**, 75, 2382 – 2391.
  101. F Brook, M. A., Laronde, F. J., Ragheb, A., *Controlling Silica Surfaces Using Responsive Coupling Agents*, *Colloid Polym. Sci.* **2003**, 281, 391–400, invited manuscript.
  99. F M. Mohamed, M. A. Brook, *Allylsilane-Modified Amino Acids from the Claisen Rearrangement*, *Helv. Chim. Acta* **2002**, 85, 4165-4181 invited manuscript
  98. F P. Zelisko, M. A. Brook, *Stabilization of  $\alpha$ -Chymotrypsin and Lysozyme Entrapped in Water-In-Silicone Oil Emulsions*, *Langmuir*, **2002**, 18, 8982-8987.
  97. F. Gang Hu, Frank LaRonde and Michael A. Brook, *Amino Acid-Terminated Silicones*, *Silicon Chem.* **2002**, 1, 215–222.
  96. F. Michael A. Brook, Paul M. Zelisko, Maeghan J. Walsh and Janinne N. Crowley, *Silicone-protein surfactants: stability of water-in-silicone oil emulsions*, *Silicon Chem.* **2002**, 1, 99–106.
  95. F M. S. Eikeland, M.-B. Hägg, Michael A. Brook, M. Ottøy, A. Lindbråthen, *Durability of Poly(dimethylsiloxane) when exposed to Chlorine Gas*, *J. Appl. Poly. Sci. A.*, **2002**, 85, 2458-2470.
  94. F Brook, M. A.; Ragheb, A. *Oxidizable Coupling Agents: Introduction of Surface Functionality*, *J. Adhesion*, **2002**, 78, 521-541.
  93. F Gilles Sèbe and Michael A. Brook, *Hydrophobization of Wood Surfaces: Covalent Grafting of Silicone Polymers*, *Wood Sci. Tech.* **2001**, 35, 269-282.
  92. C Mohamed, M.; Brook, M. A. *Synthesis of Allylsilane-Containing Amino Acids via the Claisen Rearrangement*, *Tetrahedron Lett.* **2001**, 42, 191-193.
  91. F Mustafa Mohamed and Michael A. Brook, *Photolysis of Tris(trimethylsilyl)silane: Trapping of Silyl Radicals*, *Can. J. Chem.* **2000**, 78, 1357-1362.

90. N Bain, A., Brook, M. A.; Hazendonk, P.; Reid, D. L.; Stan, R. S. *Analysis of NMR Spectra of Some Dimethylsilanes*, *Magn. Res. Chem.* **2000**, 38, 894-895.
89. F Vasiliki Bartzoka, Gladys Chan and Michael A. Brook, *Protein-Silicone Synergism at Liquid/Liquid Interfaces*, *Langmuir* **2000**, 16, 4589-4593.
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## Patents

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1. M. A. Brook, L. Loombs, P. Heritage, J. Jiang, M. McDermott, B. Underdown, *Microparticle Delivery System*, US Patent 5571531, Nov. 5, 1996.

#### **Abandoned**

2. Howard A. M. Ketelson, Michael A. Brook, and Robert H. Pelton, *A Platinum Catalyst, Method of Making and Use of Thereof*, US Provisional Patent Application: 60/025,365, Sept. 3, 1996, abandoned.

#### **Not Peer Reviewed**

##### **(a) Books**

- 1 M.A. Brook and B.E. McCarry, *Laboratory Safety Manual*, Department of Chemistry, McMaster University, McMaster University, 1986.

##### **(b) Contributions to Books**

##### **(c) Journal Articles**

##### **(d) Journal Abstracts**

##### **(e) Other, Including Proceedings of Meetings**

- 3 Book Review in *Canadian Chemical News*, 1997, 49 (6), 39, "Organosilicon Chemistry II: from molecules to materials," Auner, N.; Weis, J. Eds., VCH : Weinheim and NY, 1996.
- 2 Software Review in *Canadian Chemical News*, 1992, 44(1), 19-20 of ISIS/Draw from Molecular Design.
- 1 Book Review in *Canadian Chemical News*, 1987, 39(10) Nov., 31.9, of "Silanes, Surfaces and Interfaces, in *Chemically Modified Surfaces*, Vol. I, By Donald E. Leyden, Gordon and Breach, 1986.

#### **Presentations at Meetings**

##### **Invited**

16. Michael A. Brook, J. Guo, H. D. Sheardown, H. Chen, D. Chen, *Carbohydrate Modified Silicone Elastomers*, ISOS XIV International Organosilicon Symposium, Würzburg Germany, August 2005.
15. Michael A. Brook, *Protein and oligonucleotide compatible sol-gel preparation and controlled aggregation of primary silica particles*, IUPAC World Polymer Congress, Paris, July 2004.
14. Michael A. Brook, Hong Chen, and Heather Sheardown, *Protein Rejecting Silicone Elastomers for Scar Reduction in the Eye*, Emerging New Materials Research Day, Toronto, June 2003.
13. Michael A. Brook, Stefanie Mortimer, Cindy Liu and Paul Zelisko, *Formulating Emulsions Using Silicone-Protein Copolymers*, International Workshop on Silicon Containing Polymers ISPO 3 Troy, NY, 2003.

12. M. A. Brook, J. D. Brennan, D. Chen, H. Chen, Z. Zheng, P. Zelisko, S. Mortimer and A. Ragheb, *Harnessing Protein Activity at Silica and Silicone Interfaces*, 36<sup>th</sup> Organosilicon Symposium, Akron, May 2003.
11. Muxin Liu, Elodie Pacard, Amro Ragheb, Paul Zelisko et Michael A. Brook, *Emulsion de silicone eau dans huile : stabilisation par des protéines*, Journées de formulation: Formulation des composés silicones et fluorés: Concurrence ou complémentarité Lyon, France 9, 10 décembre 2002.
10. Michael A. Brook, Dan Chen, Kui Guo, Zhang Zheng, John Brennan, Hong Chen and Paul Zelisko, *Using silicon chemistry to stabilize proteins in silica*, XIII<sup>th</sup> International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract A-28.
9. Michael. A. Brook, Vasiliki Bartzoka, Gladys Chan and Paul Zelisko, *Are Silicones Deleterious to Protein Structure and Function?*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract B-15.
8. M. A. Brook, R. S. Stan, B. Davies, V. Bartzoka. *Combining Silicones with Biopolymers*. XII<sup>th</sup> International Symposium on Organosilicon Chemistry, Sendai, Japan, May 1999.
7. M. A. Brook and Frank J. LaRonde, *Chiral Extracoordinate Silanes: Catalytic, Enantioselective Reduction of Carbonyl Groups*, 32<sup>nd</sup> Organosilicon Symposium, Milwaukee, March 1999.
6. M. A. Brook, R. Z. Stan and A. Tseitlin, *Progress in the Chemistry of Surface Compability*, 5<sup>th</sup> International Conference on Woodfiber-Plastic Composites, Toronto, ON, May 1998, Abstract.
5. M. A. Brook, T. Kuhnen, M. J. McGlinchey, R. Ruffolo, M. Stradiotto and J. Urschey, *(Metal) Complex Solutions To Some Synthetic (Silicon) Problems*, ACS Meeting, Dallas, Apr. 1998, Kipping Symposium (J. Lambert, Awardee), Abstract 279.
4. M. A. Brook, Sonya Balduzzi, Vasiliki Bartzoka, Gang Hu, Frank LaRonde, Gilles Sèbe and Rodica Stan, *Modifying Biopolymers with Silanes and Silicones*, ACS Northeast Regional Meeting, Midland MI, May 1997, Abstract 143.
3. Michael A. Brook, David A. Valentini, Rodica Stan, Vasiliki Bartzoka and Gilles Sèbe, *Approches to the Dimensional Stabilization of Wood: Hydrophobization*, Design Industriel, Architecture et Rhéologie du Bois, Bordeaux, France, March 1997.
2. M. A. Brook, H. A. M. Ketelson, C. Gottardo and R. H. Pelton, *Particles in a Box: Hydrosilation Catalyzed by Platinum Nanoparticles Enmeshed in a Silsesquioxane Gel*, 9th International Organosilicon Conference, Montpellier, France, Sept. 1996, Abstract LD8.
1. M.A. Brook, H. Ketelson and R.H. Pelton, (Polymer Colloids Symposium), *Controlled Modification of Silica Surfaces: Polyolefin and Silicone Sterically Stabilized Colloids*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 253.

## Contributed

### a) Peer Reviewed

159. F. Gonzaga, M. A. Brook, *Structuring noble metals nanoparticles in multilayered silicone surfactants*, 89th Conference of The Canadian Society for Chemistry, Halifax NS, May 2006, Abstract.
158. Lucy Ye, Michael Brook, Robert Pelton, *Biotinylation of TiO<sub>2</sub> nanoparticles and their colloidal stability*, 92<sup>nd</sup> Annual Meeting Paperweek 2006, Montreal, QC, Canada, poster.
157. Lucy Ye, Michael Brook, Robert Pelton, *A Platform of Immobilization of Proteins on TiO<sub>2</sub> Nanoparticles*, 92<sup>nd</sup> Annual Meeting Paperweek 2006, Montreal, QC, Canada, oral presentation.
156. Lucy Ye, Michael Brook, Robert Pelton, *Biotinylation of TiO<sub>2</sub> Nanoparticles and Their Colloidal Stabilities* February 6~10, 2006, 55<sup>th</sup> Canadian Chemical Engineering Conference, Toronto, Canada.
155. Peter Kovarik, Thomas R. Covey, Richard J. Hodgson, Michael A. Brook and John D. Brennan\*, *Compound Screening using Capillary Scale Frontal Affinity Chromatography/MALDI Tandem Mass Spectrometry*. 53<sup>rd</sup> American Society for Mass Spectrometry Conference, San Antonio, TX, 2005.
154. Gina Dimopoulos-Italiano<sup>1</sup>, Michael A. Brook, Amro M. Ragheb, M. Kirk Green, *LCMS Analysis of Squalene Derivatives using ESI with Post-Column Addition of Ag<sup>+</sup>* 53<sup>rd</sup> American Society for Mass Spectrometry Conference, San Antonio, TX, 2005.
153. R.J. Hodgson, T.R. Besanger, M.A. Brook and J.D. Brennan\*. *Inhibitor Screening using Enzyme Reactor Chromatography/Tandem Mass Spectrometry*. 53<sup>rd</sup> American Society for Mass Spectrometry Conference, San Antonio, TX, 2005.
152. F. Gonzaga and M. A. Brook, *Polycarboxylate Chelating Silicone Amphiphiles*, ISOS XIV International Organosilicon Symposium, Würzburg Germany, August 2005.
151. D. B Thompson and M. A. Brook, *Silicone Protected Carbohydrates*, ISOS XIV International Organosilicon Symposium, Würzburg Germany, August 2005.
150. Lu Ye, Robert Pelton, Michael Brook, Covalent attachment of biotin to TiO<sub>2</sub> nanoparticles, 79<sup>th</sup> ACS colloid and surface science symposium, Potsdam, New York, USA,; June 13-15, 2005, Abstract No. 7-27.
149. Weian Zhao, Elodie Pacard, Carole Chaix, Christian Pichot and Michael A. Brook\*, *Controlled Silica Nanoparticle Aggregates for Oligonucleotide Synthesis*, 38th Silicon Symposium, Boulder, Colorado,; June 2005, Abstract; P17
148. Gina Dimopoulos-Italiano; Michael A. Brook; Amro Ragheb; M. Kirk Green, *LCMS Analysis of Squalene Derivatives using ESI with Post-column Addition of Ag<sup>+</sup>*, 53rd ASMS Conference on Mass Spectrometry, June 5 - 9, 2005, San Antonio, Texas, Section ThP06, Poster Number: 102.
147. Gao, Y., Amarne, H., Brook, M. A., Sheardown, H. *Bandage Contact Lenses: Silicon Oil for Interfacial Control* EMK Meeting: Toronto, Canada, June, 2005.
146. Elodie Pacard, Michael A. Brook, Christian Pichot, Carole Chaix , Amro M. Ragheb, *Elaboration of silica/polymer hybrid support for oligonucleotide synthesis and biodiagnostics*, IUPAC World Polymer Congress, Paris, July 2004.

145. Scott L.E., Zelisko P.M., Brook M.A. *Heparin Entrapped in Water-in-Silicone Oil Emulsions: A Possible Delivery Vehicle for Oral Heparin*, 87th Canadian Chemistry Conference, London ON May 2004, Abstract 751.
144. Ragheb A.M., Hrynyk M., Brook\* M.A. *The Use of Poly(ethylene glycol) to Stabilize Enzymes in Silicone Rubber*, 87th Canadian Chemistry Conference, London ON May 2004, Abstract 162.
143. John Brennan, Michael Brook, Xiaoming Zhao, Yang Chen, Richard Hodgson, Hong Long, Dina Tleugabulova, Zheng Zhang, Blaise N'Zemba, and Michael G. Organ, *New Advances in the Screening of Compound Mixtures*, Chemistry and Biology: Partners in Decoding the Genome, The National Institutes of Health, Bethesda, Maryland, March 15-16, 2004.
142. Chen, H; Sheardown, H; Brook, MA, *Generic Modification Method for Creating Biocompatible Silicone Elastomers*, International Conference and Workshop on Physical Chemistry of Bio-Interfaces, Barossa Valley, Australia, May 2004.
141. Paul M. Zelisko, Lauren E. Scott, and Michael A. Brook, *The Delivery of Proteins from Water-in-Silicone Oil Emulsions*, International Conference and Workshop on Physical Chemistry of Bio-Interfaces, Barossa Valley, Australia, May 2004.
140. Amro M. Ragheb, Stefanie A. Mortimor, Susan Jo, Michael Hrynyk and Michael A. Brook, *Silicone rubber for drug delivery applications: The effect of poly(ethylene glycol) on the drug delivery process*, International Conference and Workshop on Physical Chemistry of Bio-Interfaces, Barossa Valley, Australia, May 2004.
139. Zheng Zhang, Yang Chen, Dina Tleugabalova, John D. Brennan and Michael A. Brook, *Immobilization of Proteins within Silica and Bioanalysis Applications of Protein Entrapped Silica Monolith*, International Conference and Workshop on Physical Chemistry of Bio-Interfaces, Barossa Valley, Australia, May 2004.
138. Paul M. Zelisko, Jill J. Coo-Ranger, and Michael A. Brook, *Water-in-Silicone Oil Emulsions as Delivery Vehicles for Proteinaceous Materials*, International Conference and Workshop on Physical Chemistry of Bio-Interfaces, Barossa Valley, Australia, May 2004.
137. Chen, H, Brook, MA, Sheardown, H. *Protein-rejecting Silicone Surface Immobilization of Poly(ethylene oxide) by Covalent Bonds*, 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 653.
136. Brook, MA, Brennan, J, Zhang, Z, Chen, D, Gao, Y. *Proteins trapped in porous silica: Biomaterials Scaffolds*. 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 590.
135. Zhang, Z, Chen, Y, D'souza, R, Brennan, JD, and Brook, MA, *Biocompatible Macroporous Silica Monoliths with Entrapped Proteins*, 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 1323
134. Ragheb, AR, Hrynyk, M, Brook, MA, *Silicone-Lipase Composite: Affecting Protein-Silicone Interaction By Tailoring The Polymeric Structure*, 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 1748.
133. Amarne, H., Gao, Y., Guo, J., Chen, H., Sheardown, H., Brook, M. A. *Silicon Lenses for the Mitigation of Scarring in the Eye* MMO and EMK Meeting: Toronto, Canada, June, 2004.

132. Zelisko, PM, Ranger-Coo, J, and Brook, MA, *Water-in-Silicone Oil Emulsions as Delivery Vehicles for Proteinaceous Materials*, 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 835.
131. Chen, H, Brook, MA, Sheardown, H. *Controlled Morphology PEO-Silicone Composites Have Protein Rejecting Surfaces*, 7<sup>th</sup> International Biomaterials Conference, Sydney, Australia, May 2004, Abstract 22.
130. Brook, M. A. *Breast Implant Lawsuits – A Tempest in a C-Cup?* Rotary Lunchtime Lectures, Feb. 2004, Hamilton.
129. Amro Ragheb, Hong Chen, Meghan L. Marshall, Michael Hrynyk, Heather Sheardown and Michael A. Brook, *Controlling Protein Deposition at Silicone Elastomer Interfaces*, 227<sup>th</sup> ACS National Meeting, Anaheim, CA, March, 2004.
128. Jill J. Coo-Ranger, Paul M. Zelisko, Michael A. Brook, *Ionic silicone surfactants in water-in-silicone oil emulsions containing proteins*, 227<sup>th</sup> ACS National Meeting, Anaheim, CA, March, 2004, Abstract POL 510.
127. Paul M. Zelisko, Jill J. Coo-Ranger, and Michael A. Brook, *The Interaction of Proteins with Functionalized Silicones*, 227<sup>th</sup> ACS National Meeting, Anaheim, CA, March 2004, Abstract POL 391.
126. Michael A. Brook, Paul Zelisko, Hong Chen, Muxin Liu, Amro Ragheb, Michael Hrynyk, and Heather Sheardown, *Interfacial Control with Proteins at Silicone/Water Interfaces*, Polymerisation in Dispersed Media, PDM April 2004, Lyon, France, Abstract O5.5.
125. Elodie Pacard, Michael A. Brook, Amro M. Ragheb, Carole Chaix, and Christian Pichot, *Elaboration of Silica/polymer hybrid support for oligonucleotide synthesis and biodiagnostics*, Polymerisation in Dispersed Media, PDM April 2004, Lyon, France.
124. Yang Chen, Zheng Zhang, John D. Brennan, Michael A. Brook,\* *A glycerol-derived silica precursor for the encapsulation of protein in porous silica monoliths*, XII International Workshop on Sol-Gel Science and Technology, Sydney, Australia, August 2003, Abstract 788.
123. Michael A. Brook,\* Yang Chen, Kui Guo, Zheng Zhang, Wen Jin, Anil Deisingh and John D. Brennan\*, *Sugar-Modified Silanes: Precursors for Silica Monoliths*, XII International Workshop on Sol-Gel Science and Technology, Sydney, Australia, August 2003, Abstract O-50.
122. Masaaki Amako, Michael A. Brook, *Ring Flipping Behavior of O(SiMe<sub>2</sub>- $\eta^5$ -Indenyl)<sub>2</sub>Fe complexes and Their Co-Polymerization with Silicones*, OMCOS 12, Toronto, July 2003, Abstract.
121. Stefanie A. W. Mortimer, Paul M. Zelisko, and Michael A. Brook, *Protein Deposition On Modified Silica Surfaces*, 36<sup>th</sup> Organosilicon Symposium, Akron (won best student prize).
120. Paul M. Zelisko and Michael A. Brook, *The Properties Of Human Serum Albumin And Triethoxysilyl-Terminated Polydimethylsiloxane At The Interface Of Water-In-Silicone Oil Emulsions*, 36<sup>th</sup> Organosilicon Symposium, Akron
119. S. A. W. Mortimer, P. M. Zelisko, M. A. Brook, *A Novel Approach to Amino Acid-Modified Silicones*, 2003 IUPAC Congress and 86<sup>th</sup> Conference of The

- Canadian Society for Chemistry, Ottawa ON, Aug. 2003, Abstract. (won best undergraduate student MSED poster).
118. P. M. Zelisko, M. A. Brook, *The Interaction of Proteins with Silicone Polymers Containing Hydrophilic Moieties*, 2003 IUPAC Congress and 86th Conference of The Canadian Society for Chemistry, Ottawa ON, Aug. 2003, Abstract.
  117. A. M. Ragheb, M. A. Brook, *The role of hydrophilic additives in affecting the internal hydrophobic environment of silicone rubber: effect of polyethylene glycol species on the enzymatic activity of lipase C. rugosa entrapped in silicone composite*, 2003 IUPAC Congress and 86th Conference of The Canadian Society for Chemistry, Ottawa ON, Aug. 2003, Abstract. (Won 1 of 3 best graduate students posters).
  116. Hong Chen, Michael A. Brook and Heather Sheardown, *A New Approach to PEO-Modified Silicone Rubber: Passivation of Silicone Surfaces for Protein Rejection and Cell Growth*, 29th Annual Biomaterials Society Meeting, Reno Nevada, May 2003, Abstract.
  115. Zheng Zhang, Michael A. Brook, *The Biporous Structure of Monolithic Silica Columns Containing Entrapped Proteins*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P1-60.
  114. Paul M. Zelisko and Michael A. Brook, *The Interaction of Proteins and Silicones at Emulsion Interfaces: Analysis of Protein and Emulsion Stability*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P1-54.
  113. Amro Ragheb and Michael A. Brook, *Oxidizable Coupling Agents: Introduction of Surface Functionality*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P1-58.
  112. Hong Chen, Michael A. Brook, and Heather D. Sheardown, *An Investigation of the Surface Properties and Biocompatibility of Polyethylene Oxide-Modified Silicone Rubber*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P1-53.
  111. Elodie Pacard, Hong Chen, Michael A. Brook, and Carol Chaix, *Compatibilization of Silica Surfaces For Proteins*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P2-49.
  110. Cindy M. Liu, Paul Zelisko and Michael A. Brook, *Protein-Silicone Conjugates: Surface Activity as a Guide to Utility as Biodegradable Surfactants*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P2-29.
  109. Yang Chen and Michael A. Brook, *Syntheses of Sugar-Based Coupling Agents and their Use in Preparing Protein-Friendly Silica Surfaces*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P1-57.
  108. Masaaki Amako and Michael A. Brook, *Transition Metal-Containing Silicones From Disiloxane Compounds*, International Symposium on Organosilicon Chemistry, Guanajuato, Mexico, August 2002, Abstract P2-23.

107. Li, G.; LaRonde, F. J.; Brook, M. A. *Stereoselective reduction of ketones with triethoxysilane catalyzed by C<sub>2</sub>-symmetric titanium complexes*, 224th ACS Meeting, Boston, August 2002, Abstract ORGN 509
106. M. A. Brook, V. Bartzoka, P. Zelisko, M. Walsh *Silicone-Protein Copolymers: Controlling Interfacial and Protein Stabilization*, 1<sup>st</sup> European Silicon Days, Munich, 2001 Abstract B11.
105. Brook, M. A., Laronde, F. J., Ragheb, A., *Controlling Silica Surfaces Using Responsive Coupling Agents*, Silica 2001, Mulhouse, France, Sept. 2001.
104. Mohamed, M.; Brook, M. A. *Synthesis of  $\alpha$ -Allylsilane-Amino Acids and Their Reactions With Aromatic Acetals*, 212<sup>th</sup> ACS Meeting, Chicago, August 2001, Abstract ORGN 457.
103. Paul M. Zelisko, and Michael A. Brook, *Modified silicones for the stabilisation of proteins and enzymes in emulsions: Potential Vaccine Delivery Systems*, 212<sup>th</sup> ACS Meeting, Chicago, August 2001, Abstract POLY 403.
102. Brook, M. A., Zelisko, P. and Bartzoka, V. *Silicone-Protein Copolymers: Controlling Interfacial and Protein Stabilization*, International Workshop on Silicon Containing Polymers ISPO 2001, University of Kent at Canterbury, UK, June 2001, Abstract 57.
101. Paul Zelisko and Michael A. Brook, *Delivery of Proteinaceous Materials from Silicone Protected Microparticles and Water-in-Silicone Oil Emulsions*, Controlled Release Society, San Diego, June 2001, Abstract 6194.
100. Mustafa Mohamed and Michael. A. Brook, 84<sup>th</sup> Canadian Society for Chemistry Conference, Montreal, 2001, Abstract 1206.
99. Amro Ragheb and Michael. A. Brook, *The Role of Light in the Fouling of Wastewater UV-Disinfection*, 84<sup>th</sup> Canadian Society for Chemistry Conference, Montreal, 2001, Abstract 693.
98. Zelisko, PM; Flora, K; Brook, MA; Brennan, JD., *The Interaction of Silicone and Human Serum Albumin: Stabilisation Against Denaturation at the Interface*, 84<sup>th</sup> Canadian Society for Chemistry Conference, Montreal 2001, Abstract 1163.
97. Mustafa Mohamed and Michael. A. Brook, *C<sub>2</sub>-Symmetric Lewis Acids: Enantioselective Reduction Of Carbonyl Groups*, 34<sup>th</sup> Organosilicon Symposium, White Plains, NY, May 2001, Abstract C-8.
96. Amro Ragheb and Michael. A. Brook, *An Attempt To Use Oxidizable Silane Coupling Agents To Mitigate Fouling of Quartz Surfaces*, 34<sup>th</sup> Organosilicon Symposium, White Plains, NY, May 2001, Abstract B-22.
95. Paul Zelisko and Michael. A. Brook, *Proteins and Enzymes at the Interface of Water-in-Silicone Oil Emulsions*, 34<sup>th</sup> Organosilicon Symposium, White Plains, NY, May 2001, Abstract A-10.
94. Brook, M. A.; Zelisko, P. *Exploiting Silicone-Protein Interactions: Stabilization Against Protein Denaturation at Interfaces*, 211<sup>th</sup> ACS Meeting, San Diego, April 2001, Abstract Poly181.
93. Brook, M. A.; Ragheb, A. *Oxidizable Coupling Agents: Introduction of Surface Functionality*, Adhesion Society Conf., Williamsburg, VA, Feb. 2001, Abstract 373.

92. Zelisko, P.; Brook, M. A. 20th Conference of the Canadian Biomaterials Society, *Water-In-Silicone Oil Emulsions in the Oral Delivery and Storage of Proteins and Enzymes*, Hamilton, August 2000.
91. Vasiliki Bartzoka and Michael A. Brook, Stable Silicone-Protein Emulsions: New Routes to Topical Delivery of Proteins, Society of Cosmetic Chemists Conference, Toronto, ON, May 2000.
90. Frank J. LaRonde and Michael A. Brook, *C<sub>2</sub>-Symmetric Lewis Acids: Enantioselective Reduction Of Carbonyl Groups*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract B-17.
89. Frank J. LaRonde and Michael A. Brook, *Enantioselective Reduction Using Extracoordinate Silicon*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-31.
88. Mustafa Mohamed and Michael A. Brook, *Photolyses Of Tris(Trimethylsilyl)Silane And Tris(Trimethylsilyl)Silyl ethers: Trapping Of Silyl Radicals And Silylenes*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-34.
87. Mustafa Mohamed and Michael A. Brook, *Synthesis Of Allylsilane-Containing Amino Acids Via The Claisen Rearrangement*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-33.
86. Amro M. Ragheb, Michael A. Brook, *Squalene-Polysiloxane Cross Linked Polymer*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-35.
85. Ahmed H. Alzamy and Michael A. Brook, *Thermoplastic Silicone Elastomers*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-36.
84. Paul Zelisko and Michael A. Brook, *Enhanced Stability Of Alpha-Chymotrypsin And Alkaline Phosphatase Entrapped In Water-In-Silicone Oil Emulsions*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract PB-32.
83. V. Bartzoka, M. A. Brook, *Protein-Silicone Synergies at Liquid-Liquid Interfaces*, Gordon Research Conference on Polymer Colloids, Tilton NH, July 1999, Abstract 42.
82. Sonya Balduzzi and M. A. Brook, Stereoselective carbon-carbon bond formation via cobalt-complexed alkynes, 82<sup>nd</sup> Canadian Society for Chemistry Conference, Toronto, June 1999, Abstract 666.
81. Frank J. LaRonde; Michael A. Brook, *Stereoselective Reduction of Ketones by Histidine: Alkoxysilane Complexes*, 82<sup>nd</sup> Canadian Society for Chemistry Conference, Toronto, June 1999, Abstract 684.
80. M. Mustafa and Michael A. Brook, *Application of the Claisen Rearrangement to the Synthesis of Amino Acid-Modified Allylsilanes*, 82<sup>nd</sup> Canadian Society for Chemistry Conference, Toronto, June 1999. Abstract 923.
79. D. Alberico, M. A. Brook, *Thermally Reversible Siloxane Elastomer*, 82<sup>nd</sup> Canadian Society for Chemistry Conference, Toronto, June 1999, Abstract Number: 18 (undergrad).
78. M. Mustafa and Michael A. Brook, *Synthesis of Allylsilanes via Ester Enolate Claisen Rearrangement of Vinylsilane-Modified Amino Acids*, Quebec and Ontario Minisymposium on Biological and Organic Chemistry, Brock University, Oct. 1998, Abstract 58.

77. F. J. Laronde and Michael A. Brook, *Reduction of Ketones with Hypervalent Trialkoxysilanes: Imidazole-Mediated Reduction of Carbonyl Compounds*, Quebec and Ontario Minisymposium on Biological and Organic Chemistry, Brock University, Oct. 1998, Abstract 57.
76. S. Balduzzi and Michael A. Brook, *Stereoselective Intramolecular Allyl Transfer*, Quebec and Ontario Minisymposium on Biological and Organic Chemistry, Brock University, Oct. 1998, Abstract 59.
75. Wayne W. Y. Lau, Brendan Hyland, James M. Dickson and Michael A. Brook, *Removal of Trace Organics from Water by Pervaporation using a composite hollow fiber Membrane with a Novel Silicone coating*, 4th National symposium on Progress in Materials Research, National University of Singapore, Mar., 1998, Proceedings 546-549.
74. F. Laronde and Michael A. Brook, *Reduction of Ketones With Hypervalent Trialkoxysilanes: Imidazole Mediated Reduction Of Carbonyl Compounds*, Fifth International Conference on Heteroatom Chemistry, London Ont., July 1998, Abstract.
73. M. Mustafa and Michael A. Brook, *Application Of The Claisen Rearrangement To The Synthesis Of Allylsilane-Modified Amino Acids*, Fifth International Conference on Heteroatom Chemistry, London Ont., July 1998
72. V. Bartzoka and Michael A. Brook, *Protein-Silicone Interactions at Liquid/Liquid Interfaces*, 72<sup>nd</sup> ACS Colloid and Surface Science Symposium, Penn. State, Pennsylvania, June 1998, Abstract 59.
71. F. Laronde and Michael A. Brook, *Diels-Alder Coupling Agents: Reversible Modification of Silica Surfaces*, 31<sup>st</sup> Organosilicon Symposium, New Orleans, May 1998, Abstract.
70. R. Stan and Michael A. Brook, *Polysiloxane Polymers Containing Nitrilotriacetic Acid Chelating Groups*, 31<sup>st</sup> Organosilicon Symposium, New Orleans, May 1998, Abstract.
69. J. Jiang, V. Bartzoka, D. Valentini and Michael A. Brook, *Surface Hydrophobization of Hydrophilic Biopolymers Using Silanes and Silicones*, Polymer Colloids Gordon Conference, Tilton, NH, July 1997.
68. Ruffolo, R., Stradiotto, M., Kuhnen, T., McGlinchey, M. J., Brook, M. A., *Molecular Lego: Building Blocks For Inorganometallic Polymers*, 80<sup>th</sup> Canadian Society for Chemistry Conference, Windsor, June 1997, Abstract.
67. Stradiotto, M., Rigby, S., Brook, M. A., McGlinchey, M. J., *Stereochemically Non-Rigid Poly(indenyl)silanes: A Synthetic, Multidimensional NMR and X-ray Crystallographic Study*, 80<sup>th</sup> Canadian Society for Chemistry Conference, Windsor, June 1997, Abstract.
66. Ralph Ruffolo, *Allylsilanes as Possible Precursors to Metal-Stabilised Silicon Cations*, 30<sup>th</sup> Organosilicon Symposium, London, Ont., May 1997, Abstract.
65. Gilles Sèbe, *Hydrophobisation of Pine Wood Surfaces by Grafting Polysiloxanes*, 30<sup>th</sup> Organosilicon Symposium, London, Ont., May 1997, Abstract.
64. Gang Hu, *Novel Polysiloxane Polymers Modified with Amino Acids*, 30<sup>th</sup> Organosilicon Symposium, London, Ont., May 1997, Abstract.

63. Mustafa Mohamed, *Photochemistry of Tris(trimethylsilyl)silane*, 30<sup>th</sup> Organosilicon Symposium, London, Ont., May 1997, Abstract.
62. Urquhart S.G., Hitchcock A.P., Brook M.A., Turci C.C., Denk M.,  *$\pi$ -Delocalization in Organosilanes: A Core Excitation Spectroscopy Investigation*, 80<sup>th</sup> Canadian Society for Chemistry Conference, Windsor, June 1997, Abstract.
61. Michael A. Brook, S. Balduzzi, V. Bartzoka, G. Hu, F. LaRonde, G. Sèbe and R. Stan, *Modifying Biopolymers with Silanes and Silicones*, 4<sup>th</sup> International Conference on Woodfiber-Plastic Composites, Madison, WI, May 1997, Abstract.
60. Gilles Sèbe and Michael A. Brook, *Hydrophobisation of Pine Wood Surfaces by Grafting Polysiloxanes*, 4<sup>th</sup> International Conference on Woodfiber-Plastic Composites, Madison, WI, May 1997, Abstract.
59. H. A. Ketelson, Y. M. Heng, M. A. Brook and R. Pelton, *Application of Microscopy Imaging and Analysis in the Characterization of a Model Colloidal Silica System*, 1996 Microscopy and Microanalysis Conference, Minneapolis, Minn., Aug., 1996.
58. R. Ruffolo, M. A. Brook and M. J. McGlinchey, *Towards the Stabilization of Silicon Cations*, 9th International Organosilicon Conference, Montpellier, France, Sept. 1996, Abstract OB21.
57. T. Kuhn, R. Ruffolo, M. Stradiotto, M. A. Brook and M. J. McGlinchey, *Molecular Lego: Building Blocks for Inorganometallic Polymers*, 9th International Organosilicon Conference, Montpellier, France, Sept. 1996, Abstract PB24.
56. V. Bartzoka, M. A. Brook M. R. McDermott, *Silicone-Protein Absorption*, 9th International Organosilicon Conference, Montpellier, France, Sept. 1996, Abstract PB23.
55. V. Bartzoka, M. A. Brook, M. R. McDermott, *Protein-Silicone Interactions at a Solid-Liquid Interface*, 212<sup>th</sup> ACS Meeting, Orlando, Florida, Aug. 1996, Abstract COLL-39.
54. H. A. M. Ketelson, R.H. Pelton and M.A. Brook, *Surface Properties of Hydrosilane-Modified Silica Colloids*, 212<sup>th</sup> ACS Meeting, Orlando, Florida, Aug. 1996, Abstract COLL-202.
53. H. A. M. Ketelson, M.A. Brook and R.H. Pelton, *Preparation of Organo-Platinum nanoparticles Supported on Silica Spheres*, 70<sup>th</sup> ACS Colloid and Surface Symposium, Clarkson University, Potsdam, NY, June 1996, Abstract 43.
52. V. Bartzoka, M. A. Brook, D. Valentini and M. R. McDermott, *Surface Interactions between Proteins and Silicon Polymers: Physical and Covalent Adhesion*, 70<sup>th</sup> ACS Colloid and Surface Symposium, Potsdam NY, June 1996, Abstract 147.
51. Robert Pelton, Huining Xiao, Michael A. Brook and Archie Hamielec, "The flocculation of polystyrene latex with mixtures of poly(p-vinyl phenol) and poly(ethylene oxide)", Paper Chemistry and Coating, Ottawa, June (1996).
50. Rodica Stan and Michael A. Brook, *Wood-Polyethylene Composite Materials*, 3<sup>rd</sup> International Conference on Woodfiber-Plastic Composites, Toronto, May 1996, Abstract.

49. Thomas Kuhnen, R. Ruffolo, M. Stradiotto, Michael A. Brook and Michael A. McGlinchey, *Molecular Lego: Building Blocks for Inorganometallic Polymers*, 29<sup>th</sup> Organosilicon Symposium, Evanston, Ill., Apr. 1996, Abstract P-5.
48. Vasiliki Bartzoka, Michael A. Brook and David Valentini, *Silicon-based Coupling Agents for the Compatibilization of Hydrophobic and Hydrophilic Polymers*, 29<sup>th</sup> Organosilicon Symposium, Evanston, Ill., Apr. 1996, Abstract P-23.
47. Michael A. Brook, Rodica S. Stan and David Valentini, *Silicone-Protein-Starch Adsorption*, 29<sup>th</sup> Organosilicon Symposium, Evanston, Ill., Apr. 1996, Abstract P-23.
46. Mark Stradiotto, Suzie Rigby, Don Hughes, Alex Bain, Michael A. Brook and Michael A. McGlinchey, *A Multi-Dimensional NMR Study on the Fluxional Behaviour of Tris(indenyl)methylsilane: Molecular Dynamics Mapped Onto A "Hypercube"*, 29<sup>th</sup> Organosilicon Symposium, Evanston, Ill., Apr. 1996, Abstract P-5.
45. F. David Bayles and Michael A. Brook, *Understanding the  $\alpha$ - and  $\beta$ -Silyl Cation Effect*, 29<sup>th</sup> Organosilicon Symposium, Evanston, Ill., Apr. 1996, Abstract P-7.
44. H. A. M. Ketelson, M.A. Brook and R.H. Pelton, *Colloidal Stability of Functionalized Silica Colloids in Polar Organic Media*, Gordon Research Conference on Polymer Colloids, Tilton, NH, 1995, Abstract P-45.
43. Michael A. Brook, H. A. M. Ketelson and R.H. Pelton, *Silicones on the Surface: Synthetic Approaches to Model Sterically Stabilized Colloidal Systems*, Gordon Research Conference on Polymer Colloids, 1995, Abstract P-46.
42. Michael A. Brook, Vasiliki Bartzoka, Jason R. Bernais and David A. Valentini, *Silicone-Biopolymer Interactions: Physical versus Covalent Adhesion*, Associating Polymers Conference, Loen, Norway, June 1995, Abstract P-7.
41. F. David Bayles and Michael A. Brook,  *$\alpha$  and  $\beta$ -Silyl Carbenium Ions*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 286.
40. David A. Valentini, Michael A. Brook, Vasiliki Bartzoka and Mark R. McDermott, *Approaches to Grafting Silicones to Cellulose and Starch*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 686.
39. Vasiliki Bartzoka, Michael A. Brook, David A. Valentini and Mark R. McDermott, *Surface Interactions Between Proteins and Silicone Polymers: Physical and Covalent Adhesion*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 687.
38. Jianxiong Jiang, Michael A. Brook and Mark R. McDermott, *Silicone Grafted Starch Microspheres: Approaches to the Delivery of Bioactive Polymers*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 688.
37. H. A. M. Ketelson, M.A. Brook and R.H. Pelton, *Colloidal Stability of Functionalized Silica Colloids in Polar Organic Media*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 254.
36. Ralph Ruffolo, Michael A. Brook and Michael J. McGlinchey, *Towards the Stabilization of Silenes on Bimetallic Clusters*, 78th Canadian Society for Chemistry Conference, Guelph, 1995, Abstract 853.

35. F. D. Bayles and M. A. Brook,  *$\alpha$  and  $\beta$ -Silyl Carbenium Ions*, 28th Organosilicon Symposium, Gainesville, Florida, April 1995, Abstract P-7.
34. R. Ruffolo, M. A. Brook and M. J. McGlinchey, *Towards the stabilization of silenes on bimetallic clusters*, 28th Organosilicon Symposium, Gainesville, Florida, April 1995, Abstract P-9.
33. D. A. Valentini, M. A. Brook, V. Bartzoka and Mark R. McDermott, *Approaches to Grafting Silicones to Cellulose and Starch*, 28th Organosilicon Symposium, Gainesville, Florida, April 1995, Abstract P-10.
32. C. Le Roux, H. Yang, S. Wenzel and M. A. Brook, *Using "Anhydrous" Hydrolysis to Favor Formation of Hexamethylcyclotrisiloxane from Dimethyldichlorosilane*, 28th Organosilicon Symposium, Gainesville, Florida, April 1995, Abstract B-18.
31. V. Bartzoka, M. A. Brook, D. Valentini<sup>\*</sup> and Mark R. McDermott<sup>†</sup>, *Surface Interactions Between Proteins and Silicon Polymers: Physical and Covalent Adhesion*, 28th Organosilicon Symposium, Gainesville, Florida, April 1995, Abstract P-6.
30. M.A. Brook and T. Stefanac, *Silane Radical Polymerization Initiators; Functionalized Homopolymers and Block Copolymers*, IIIrd International Symposium on Radical Copolymers, Lyon, France, April 1994, Abstract P-52.
29. H. Ketelson, R.H. Pelton and M.A. Brook, *Polyolefin and Silicone Sterically Stabilized Colloids*, IIIrd International Symposium on Radical Copolymers, Lyon, France, April 1994, Abstract, Abstract 148.
28. M.A. Brook and T. Stefanac, *Silane Radical Polymerization Initiators; Functionalized Homopolymers and Block Copolymers*, XXVII Organosilicon Symposium, Troy, New York, March 1994, Abstract B-29.
27. M.A. Brook, G. McGibbon and C. Roos, *Towards Silanones*, XXVII Organosilicon Symposium, Troy, New York, March 1994, Abstract P-54.
26. R. Ruffolo, L. Girard, H. Gupta, A. Decken, M.A. Brook and M.J. McGlinchey, *Towards Metal Stabilized Silicon Cations*, XXVII Organosilicon Symposium, Troy, New York, March 1994, Abstract P-57.
25. M.A. Brook and M. Roth, *The substitution of Electrophiles in Polymeric Systems: Surprisingly Unreactive Vinylsilanes*, XXVII Organosilicon Symposium, Troy, New York, March 1994, Abstract P-55.
24. H. Ketelson, M.A. Brook and R.H. Pelton, *Post-Grafting Silicone Polymers to Vinyl Modified Colloidal Silica Spheres: Switching from an Electrostatically Stabilized Dispersion to a Sterically Stabilized Dispersion*, XXVII Organosilicon Symposium, Troy, New York, March 1994, Abstract P-30.
23. J.M. Dickson, M.A. Brook, C.K. Yeom, J. Jiang, H.K. Gupta, K. Rilling and B.J. Trushinski, *Development of crosslinked oligosilystyrene pervaporation membranes for the removal of chlorohydrocarbons from water*, International Congress on Membranes and Membrane Processes, (ICOM-93), Heidelberg, Germany, Sept. 1993, Abstract 5.11.
22. Jianxiong Jiang and Michael A. Brook, *The Redistribution Reactions Between Cyclic Silicones and Trichlorosilanes*, Canadian Society for Chemistry Conference, Sherbrooke, June 1993, Abstract 540 IN E3.

21. Courtney Henry and Michael A. Brook, *Electrophilic Addition Reactions Involving Organosilane  $\pi$ -Nucleophiles*, Canadian Society for Chemistry Conference, Sherbrooke, June 1993, Abstract 139 IN BSP.
20. M. A. Brook, *The  $\beta$ -effect: Modifying the Ligands on Silicon for Synthetic Control*, OMCOS 6, Utrecht, The Netherlands, August 1991, Abstract A-70.
19. G. A. McGibbon, M. A. Brook and J. K. Terlouw, *Investigation of  $\beta$ -Silicon Vinyl Carbenium Ions in the Gas Phase*, Canadian Chemical Conference, Hamilton, June 1991, Abstract 857P.
18. C. Dallaire and M. A. Brook, *The Relative Magnitude of the  $\beta$ -effect of Silyl, Germyl and Stannyl Groups in the Stabilization of Vinyl Cations*, Canadian Chemical Conference, Hamilton, June 1991, Abstract 702P.
17. C. Henry, R. Jueschke and M. A. Brook, *Stereocontrolled Addition Reactions of Carbon Electrophiles to Styrylsilanes*, Canadian Chemical Conference, Hamilton, June 1991, Abstract 700P.
16. P. Modi, M. A. Brook and J.D. Dickson, *Silicon Functionalized Styrene Polymers: Cationic Control with the  $\beta$ -effect*, Canadian Chemical Conference, Hamilton, June 1991, Abstract 461P.
15. M. A. Brook, D.K. Chau and W. Yu, *Electrophilic Cleavage Reactions of Alkoxyhydrosilanes: The Special Case of Tartaric Acid*, XXIV Organosilicon Symposium, El Paso, April 1991, Abstract 99.
14. R. H. Pelton, A. Osterroth and M. A. Brook, *Steric Stabilization of Colloidal Particles*, 73rd Canadian Chemical Conference, Halifax, July 1990, Abstract 741.
13. C. Dallaire and M. A. Brook, *Study of the Stabilization of Vinyl Cations ( $\beta$ -effect) by Group 14 Metals*, IX International Symposium on Organosilicon Chemistry, Edinburgh, Scotland, July 1990, Abstract 4.8.
12. M. A. Brook, R. Jueschke, W. Yu and A. Neuy, *Electrophilic Addition Reactions of  $\beta$ -Silylstyrenes: The Pursuit of a Stable  $\beta$ -Silyl Carbocation*, IX International Symposium on Organosilicon Chemistry, Edinburgh, Scotland, July 1990, Abstract 4.7.
11. Michael A. Brook and S. Müller, *The  $\beta$ -effect in Silyl Enol Ether Reactions: Trapping the Intermediate Siloxy Carbonium Ion*, XXIII Organosilicon Symposium, Midland, Michigan, April 1990, Abstract B4.
10. Michael A. Brook, *The  $\beta$ -effect: Changing the Ligands on Silicon*, 17th Annual Ontario-Quebec Physical Organic Minisymposium, Quebec, Nov. 1989.
9. Michael A. Brook, Peter Hülser and Thomas Sebastian, *Oligotrichlorosilylstyrenes: Highly Functionalized Silicone Precursors*, 25th Canadian High Polymer Symposium, Mississauga, Canada, Aug. 23-25, 1989.
8. Michael A. Brook, Mahmud A. Hadi and Axel Neuy, *An Examination of the  $\beta$ -Effect in an Addition Reaction with Different Ligands on Silicon*, XXII Organosilicon Symposium, Philadelphia, USA, April 1989, Abstract P-15.
7. Michael A. Brook, Elizabeth Jefferson and Thomas Sebastian, *Polytrihalosilylstyrenes: Exploiting the  $\beta$ -Effect for Polymer Synthesis*, 3rd North American Chemical Congress, June 1988, Toronto, Canada, Abstract ORGN-50.

6. Michael A. Brook and Christina H. Kremers, *Glycol-Silicones: Polymeric Organic Reagents?*, XXI Organosilicon Symposium, June 1988, Montreal, Canada, Abstract P-20.
5. Michael A. Brook, *Trihalosilylstyrenes: What happened to the  $\alpha$ - and  $\beta$ -Effects*, 15th Annual Physical-Organic Minisymposium, Nov. 1987, Mississauga, Canada.
4. Michael A. Brook and Peter Hülser, *Silyl Triflates: Activators for Carbon-Carbon Bond Formation*, Chemical Institute of Canada Conference, Quebec, June 1987, Abstract ORG-42-D2.
3. Nick Henry Werstiuk, Michael A. Brook and Peter Hülser, *Thermolysis of Silyl Esters: An Ultraviolet Photoelectron Study*, 14th Annual Ontario-Quebec Physical Organic Minisymposium, Nov. 1986, Toronto.
2. Michael A. Brook and Dieter Seebach, *Stabilized Cyclic Nitronates: Intermediates for More Complex Heterocycles*, 10th International Congress of Heterocyclic Chemistry, August 1985, Waterloo, Canada, Abstract G-5-54.
1. T.H. Chan and Michael A. Brook, *Some Uses of Trimethylchlorosilane in Organic Synthesis*, Chemical Institute of Canada Conference, July 1982, Toronto, Abstract OR-18-7.

#### **Invited Lectures: at Companies**

- |    |  |            |
|----|--|------------|
| 39 | Wacker Chemie, Burghausen Germany  | Jan. 2006  |
|    | <b><i>Using Synthesis to Structure Interfaces: Making Silica and Silicones Biocompatible</i></b>                                       |            |
| 38 | Xerox (XRCC)   | Feb. 2005  |
|    | <i>Learning from Nature: Morphological Control of Silica under Mild Conditions</i>   |            |
| 37 | Vistikon, Jacksonville Florida   | Dec. 2004  |
|    | <i>Controlling biology at silicone interfaces: an integrated approach to ocular materials</i>  |            |
| 36 | AMO, Newport Beach, CA   | March 2004 |
|    | <i>Controlling biology at silicone interfaces: an integrated approach to ocular materials</i>  |            |
| 35 | Specialty Minerals, Allentown, PA  | March 2004 |
|    | <i>Protein-doped, controlled morphology silica monoliths and chelating silicones: Learning from nature</i>                             |            |
| 34 | Air Products, Allentown, PA  | March 2004 |
|    | <i>Protein-doped, controlled morphology silica monoliths: Learning from nature</i>   |            |
| 33 | QLT, Vancouver   | March 2004 |
|    | <i>An Integrated Approach to New Ocular Materials</i>  |            |
| 32 | Novartis Cibavision, Atlanta Georgia   | June 2003  |
|    | <i>Stabilizing Proteins in Silica and Silicones</i>  |            |
| 31 | Alcon, Fort Worth  | June 2003  |
|    | <i>Stabilizing Proteins in Silica and Silicones</i>  |            |
| 30 | Dow Corning, Midland Michigan  | Apr. 2002  |
|    | <i>Controlling Enzyme Stability in Water-in-Silicone Oil Emulsions</i>   |            |
| 29 | Genencor, Palo Alto  | Aug. 2001  |
|    | <i>Silicone/protein interactions: Modifying hydrophobic/hydrophilic interactions to control both protein and interfacial stability</i> |            |
| 28 | Sasol, Austin Texas  | Aug. 2001  |

*An Introduction to Silanes and Silicones*

- 27 General Electric Corporate Research and Development, Waterford NY May 2001  
*Silicones at Biopolymers Interfaces: A Look at Beneficial and Not-So-Beneficial Fouling*
- 26 NPS Pharmaceuticals Mar. 2001  
*Silicone:Protein Conjugates: Emulsions that Stabilize Proteins Against Denaturation*
- 25 Alcon, Fort Worth, Texas Feb. 2001  
*Protein-Silicone Mixtures for Biological Cleaning Applications*
- 24 Glaxo Canada Feb. 2001  
*Silicone:protein conjugates: emulsions that stabilize proteins against denaturation.*
- 23 GE-Bayer, Leverkusen June 2000  
*Silicon at the Interface: New Surface Active Silanes and Silicones*
- 22 Goldschmidt, Essen June 2000  
*Silicon at the Interface: New Surface Active Silanes and Silicones*
- 21 Specialty Minerals, Allentown PA April 2000  
*Chelating Silicones*
- 20 CK Witco Corp. (Sistersville WV) Dec. 1999  
*Looking for New Hydrophilic Substrates to Bind to Silicones*
- 19 Michigan Molecular Institute, Midland MI Oct. 1999  
*Silicones at the Interface: What Do Biopolymers Offer*
- 18 General Electric, Waterford Oct. 1999  
*Silicones at the Interface: The Benefits of Combining Silicones with Biopolymers*
- 17 Unilever, Port Sunlight, UK Sept. 1998  
*Working with Silicones*
- 16 National Starch, New Jersey June 1998  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 15 Brantford Chemical Inc. Dec. 1997  
*Using Silicon Chemistry in Drug Delivery: Prodrugs Based on Modified Silica and Oral Protein Delivery Using Silicones*
- 14 Unilever, UK, Dec. 1997  
*Surface Active Materials Based on Silanes, Silicones and Natural Polymers.*
- 13 Dow Corning Corp. Sept. 1997  
*Silicone-Organic Copolymers the Natural Way: An Exploration of Silicone- and Silane-Modified Biopolymers*
- 12 MacMillan Bloedel, Vancouver BC Sept. 1997  
*(Reversible) Modification of Biopolymers Using Silane, Silicone and Organic Coupling Agents.*
- 11 Eastman Chemical, Kingsport, Tennessee Aug. 1997  
*Wood-Plastic Composites: A Role for Organosilane and Silicone Chemistry*
- 10 Rhône Poulenc, Lyon, France Feb. 1997  
*Two Very Different Areas of Silicone Chemistry: Hydrosilsesquioxane-platinum catalysts and Silicone-biopolymer copolymers*
- 9 General Electric, Schenectady, NY Dec. 1996

*Hard and soft siloxanes: hydrosilsequioxane: platinum catalysts and silicone: protein copolymers*

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| 8 | 3M London, Ontario   | Sept. 1996 |
|   | <i>Sticking to Biopolymers: Using the Concept of Functional Group Protection in Polymer Adhesion</i> |            |
|   | Rhône Poulenc, Paris, France (2 lectures)  | May 1996   |
| 7 | <i>Sterically Stabilized Silica Colloids</i>   |            |
| 6 | <i>Silicone-Protein Copolymers</i>   |            |
| 5 | Organon, Akzo, Oss, The Netherlands  | April 1993 |
|   | <i>Silicon as Mediator: Making the Drugs and Delivering Them to the Patient</i>                      |            |
| 4 | Shell Research Amsterdam (KSLA)  | July 1990  |
| 3 | Dow Corning Corporation (Midland, USA)   | April 1990 |
| 2 | University of Toronto  | April 1988 |
| 1 | Xerox Research Centre of Canada  | Sept. 1988 |

**Invited Lectures: at Universities**

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|----|--|-------------|
| 81 | Michael A. Brook, McMaster University Undergraduate Chemistry Society                              | March 2006. |
|    | <i>Fighting the Imposter Syndrome as a Chemist,</i>  |             |
| 80 | Universite de Montpellier, II, France  | Jan. 2006   |
|    | <i>La silicone et la silice dans une monde biologique: le contrôle de l'interface</i>              |             |
| 79 | Brock University, Chemistry Department   | Oct. 2004   |
|    | <i>Controlling protein stability in silicones and silica: Synthesis of new biomaterials</i>        |             |
| 78 | University of Waterloo, Chemistry Department   | Oct. 2004   |
|    | <i>Controlling protein stability in silicones and silica: Synthesis of new biomaterials</i>        |             |
| 77 | McMaster University, BMR Summer Research Program Weekly Seminar Series, June 2004                  |             |
|    | <i>Compatibilizing proteins with silica and silicones (what do graduate students actually do?)</i> |             |
| 76 | Institute of Chemistry, Chinese Academy of Sciences, Beijing                                       | Nov. 2003   |
|    | <i>Using Silicone:Protein Interactions to Stabilize Water/Oil Interfaces and Protein Structure</i> |             |
| 75 | Qingdao University of Technology   | Nov. 2003   |
|    | <i>Stereocontrol Using Silyl Groups: Enantioselective Reductions and Claisen Rearrangements</i>    |             |
| 74 | Huazhong University of Science and Technology  | Nov. 2003   |
|    | <i>Using Silicone:Protein Interactions to Stabilize Water/Oil Interfaces and Protein Structure</i> |             |
| 73 | Wuhan University of Technology   | Nov. 2003   |
|    | <i>Protein-Doped Mesoporous Silica for Drug Screening Applications</i>                             |             |
| 72 | Nanjing University   | Nov. 2003   |
|    | <i>Using Silicone:Protein Interactions to Stabilize Water/Oil Interfaces and Protein Structure</i> |             |
| 71 | UWEB (University of Washington Engineered Biomaterials), Seattle,                                  | May 2003    |
|    | <i>Stabilizing Proteins in Silica and Silicones</i>  |             |
| 70 | Ian Wark Research Institute, University of South Australia, Adelaide, South Australia              |             |

- Michael A. Brook, Frank LaRonde, Mustafa Mohamed and Forrest Li      March 2003  
*Stereocontrol Using Silyl Groups: Enantioselective Reductions and Claisen Rearrangements*
- 69 Ian Wark Research Institute, University of South Australia, Adelaide, South Australia  
M. A. Brook, Dan Chen, Kui Guo, Zhang Zheng, John Brennan, and Paul Zelisko March 2003  
*Formation of Protein-Containing Controlled Pore Silica for Drug Discovery*
- 68 Perspectives on Silicon (6 hours lectures during a 30 hour short course), Ian Wark Research Institute, University of South Australia, Adelaide, South Australia      July 2002
- 67 Queensland University of Technology, Brisbane, Australia      June 2002  
*Bringing Organic Chemistry to Silicon-based Interfaces*
- 66 University of Sydney, Australia      June 2002  
*The Passivation of Silica and Protein/Water Interfaces Using Silane Coupling Agents and Functional Silicones.*
- 65 Flinders University, Adelaide, Australia      June 2002  
*Stabilization of Water-in-Silicone Oil Emulsions: Surfactants Formed by the Interaction of Proteins/enzymes and Functionalized Silicones*
- Preparing and Passivating Silica: Matching Surface Chemistry to Application*
- 64 University of South Australia, Adelaide, Australia      June 2002  
*The Passivation of Silica and Protein/Water Interfaces Using Silane Coupling Agents and Functional Silicones.*
- 63 McMaster University: Undergraduate Chemistry Series      March 2002  
*From Oral Vaccines to Breast Implants: What Happens When Proteins Meet Silicones?*
- 62 Ecole Nationale Supérieure, Lyon, France      Feb. 2002  
*Protéines chez soi: Dans les silicones et dans la silice (New homes for proteins in silicones and silica)*
- 61 University of Dresden, Germany, Institute of Polymer Research      Feb. 2002  
*The passivation of silica and silicone surfaces using silane coupling agents and proteins.*
- 60 University of Toronto      Feb. 2001  
*Silicone/protein interactions: Modifying hydrophobic/hydrophilic interactions to control both protein and interfacial stability*
- 59 University of Windsor      Sept. 2000  
*Exploiting Extracoordinate Silicon: Enantioselective Reductions and Aldol Reactions Catalyzed by Chiral Amines (and some Silicone-Protein Stuff)*
- 58 Institut National des Sciences Appliquées de Lyon      July 2000  
*Silicium à l'Interface: Silanes et Silicones Fonctionnalisés*
- 57 Institut Charles Sadron, Université Louis Pasteur      June 2000  
*Silicium à l'Interface: Silanes et Silicones Fonctionnalisés*
- 56 Université de Bordeaux I      May 2000  
*Combining Silicones and Biopolymers: Controlling the Interface (en français)*
- 55 Ecole Normale Supérieure de Lyon      May 2000  
*Silicium à l'Interface: Silanes et Silicones Fonctionnalisés*
- 54 University of Twente      May 2000

- Silicon at the Interface: New Surface Active Silanes and Silicones*
- 53 University of Amsterdam May 2000  
*Exploiting Extracoordinate Silicone: Enantioselective Reductions and Aldol Reactions Catalyzed by Chiral Amines*
- 52 Kyoto University June 1999  
*Chiral Extracoordinate Hydrosilanes Derived from Bidentate Ligands: Enantioselective Reduction of Ketones*
- 51 Kyoto Institute of Chemistry June 1999  
*Gifts From Nature: New Materials From Silicones and Biopolymers*
- 50 Chinese University of Hong Kong May 1999  
*Gifts From Nature: New Materials From Silicones and Biopolymers*
- 49 University of Hong Kong May 1999  
*Chiral Extracoordinate Silanes: Catalytic and Enantioselective Reduction*
- 48 Hong Kong University of Science and Technology May 1999  
*Chiral Extracoordinate Silanes Derived From Histidine: Catalytic and Enantioselective Reduction*
- 47 McMaster University President's Stewardship "Over the Ivy Wall" March 1999  
*Confusing Nature: What does Lemon Pledge have to do with Oral Vaccines?*
- 46 Chemical Engineering, McMaster University Feb. 1999  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 45 Brock University Feb. 1999  
*Stereoselective Reduction of Ketones by Histidine: Alkoxysilane Complexes*
- 44 Mount Allison University Nov. 1998  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 43 University of New Brunswick Nov. 1998  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 42 Acadia University Nov. 1998  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 41 Dalhousie University Nov. 1998  
*Confusing Nature: A Look at the Hydrophobization of Biopolymers Using Silanes and Silicones*
- 40 McMaster University Board of Governors Oct. 1998  
*Combining Silicones and Biopolymers: New Materials*
- 39 Telemark University, Porsgrunn, Norway Feb. 1998  
*Silicone Degradation Mechanisms*
- 38 Swedish Institute for Pulp and Paper, Stockholm and  
 Swedish Institute For Surface Science, Stockholm Dec. 1997  
*Silane and Silicone Coupling Agent Chemistry: Are Biopolymer Surfaces Like Siliceous Surfaces?*
- 37 University of Toronto, Faculty of Pharmacy, Oct. 1997

*Using Silicon Chemistry in Drug Delivery: Prodrugs Based on Modified Silica and Oral Protein Delivery Using Silicones*

- 36 University of British Columbia Sept. 1997  
*Modifying Biopolymers with Silanes and Silicones*
- 35 Brockhouse Institute for Materials Science, McMaster University Jan. 1997  
*Hard and soft siloxanes: hydrosilsequioxane: platinum catalysts and silicone: protein copolymers*
- 34 McMaster Undergraduate Chemistry Club Nov. 1996  
*Silicon in Biology*  
*Organosilanes as Protecting Groups: Different Approaches to the Stabilization of Small Molecules, Polymers, Transition Metals and Surfaces*
- Université Paul Sabatier, Toulouse, France (3 lectures) June 1996
- 33 *Organosilanes in an Inorganic World and Inorganic Silicon in an Organic World*
- 32 *What Happens When Silicon Meets Biology*
- 31 *Stabilized Group 14 Cations*
- Université de Bordeaux I, France, (3 lectures) May 1996
- 30 Universidad del Pais Vasco, San Sebastian, Spain June 1996
- 29 *Organosilanes in an Inorganic World and Inorganic Silicon in an Organic World*
- 28 *What Happens When Silicon Meets Biology*
- 27 *Stabilized Group 14 Cations*
- 26 Landbouw Universiteit Wageningen, Wageningen, Netherlands May 1996  
*Silicones at the Interface: Starch/Protein/Silicone Microparticles as Oral Vaccines*
- 25 Université de Namur, Belgium May 1996  
*Stabilizing  $\beta$ -Cations and Protecting Transition Metals with Silicon*
- 24 Rijks Universiteit Utrecht June 1995  
*Controlled Modification of Silica Surfaces: Polyolefin and Silicone Sterically Stabilized Silica Colloids*
- 23 Queen's University Sept. 1994  
*Silicone at the Interface: What happens when it's found in unusual places*
- 22 McMaster University Oct. 1993  
*Silicon Mediated Cope-type Cyclizations OR After one year in the Netherlands, what does Fokkje (fok-ya) really mean?*
- 21 University of Western Ontario Sept. 1993  
*Silicon Mediated Cope-type Cyclizations*
- 20 University of Montpellier May 1993  
*Silicon Bearing Electron Withdrawing Groups: Exploiting the Differences*
- 19 University of Toulouse May 1993  
*Silicon Bearing Electron Withdrawing Groups: Exploiting the Differences*
- 18 University of Bordeaux May 1993  
*Silicon as Mediator: Making the Drugs and Delivering Them to the Patient*
- 17 Free University of Amsterdam March 1993  
*Silicon Bearing Electron Withdrawing Groups: Exploiting the Differences*
- 16 Open University, Milton Keynes, England March 1993  
*A Silicon Transplant: From the  $\beta$ -effect to Polymers (focus on silicon extracoordination)*

15	University of Sussex	March 1993
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers (focus on silicon hyperconjugation)</i>	
14	University of Utrecht:	Feb. 1993
	<i>Silicon Bearing Electron Withdrawing Groups: Exploiting the Differences</i>	
13	University of Groningen	Feb. 1993
	<i>Silicon Bearing Electron Withdrawing Groups: Exploiting the Differences</i>	
12	University of Amsterdam	Jan. 1993
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers (focus on synthesis)</i>	
11	Technische Hochschule Darmstadt	Jan. 1993
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers (focus on <math>\beta</math>-effect)</i>	
10	Universität Kaiserslautern	Jan. 1993
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers (focus on silicon hyperconjugation)</i>	
9	ETH-Zürich (Seebach Group Meeting)	Feb. 1993
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers</i>	
	Centre of Advanced Scientific Investigation (CINVESTAV) Mexico City, (2 lectures)	March 1992
8	<i>Polymeric Materials Derived from the <math>\beta</math>-Effect</i>	
7	<i>The <math>\beta</math>-effect: Modifying the Ligands on Silicon</i>	
6	Guelph University	March 1992
	<i>A Silicon Transplant: From the <math>\beta</math>-effect to Polymers</i>	
5	SUNY Binghamton (New York)	March 1991
4	Universiteit van Amsterdam	July 1990
3	McMaster University (Peacock Lecture Series)	Oct. 1989
2	University of Western Ontario	Oct. 1988
1	Université de Montréal	Dec. 1988

### **Courses Taught**

<b>2005-06</b>		<b>Approximate</b>
<b>Enrolment</b>		
Chem 756	Silicon Chemistry	8
Chem 20A3	Organic Synthesis	380
Total enrolment is about 650 – 2 sections		
Chem 4PP3	Polymer Chemistry	22
<b>2004-05</b>		<b>Approximate</b>
<b>Enrolment</b>		
Killam Research Fellowship (until Jan. 2005)		
Chem 4G06	(Course coordinator)	15
Research supervisor		
1		
Chem 1AA3		350
<b>2003-04</b>		<b>Approximate</b>
<b>Enrolment</b>		

Killam Research Fellowship		
Chem 4G06	(Course co-coordinator)	22
Research supervisor		
2		
<b>2002-03</b>		<b>Approximate</b>
<b>Enrolment</b>		
Chem 760	Organic Synthesis	8
Chem 2BA3	Organic Synthesis	42
Chem 4G06	(Course coordinator)	8
(on Killam Fellowship starting Jan. 2003)		
<b>2001-02</b>		<b>Approximate</b>
<b>Enrolment</b>		
Chem 2L03	Organic Laboratory	42
Chem 2BA3	Organic Synthesis	42
Chem 1AA3	Introductory Chemistry (3 units)	225
<b>2000-01</b>		<b>Approximate</b>
<b>Enrolment</b>		
Chem 760	Organic Synthesis	8
Chem 756	Organosilicon Chemistry	6
Chem 2L03	Organic Laboratory	18
Chem 4G6	Supervisor, Undergraduate Thesis	1
Chem 2BA3	Organic Synthesis	18
Chem 1AA3	Introductory Chemistry (3 units)	275
<b>1999-2000</b>		<b>On sabbatical</b>
Chem 4G6	Supervisor, Undergraduate Thesis	2
<b>1998-99</b>		
Chem 760	Organic Synthesis	4
Chem 4G6	Supervisor, Undergraduate Thesis	2.5
Chem 4D3	Organic Synthesis	16
Chem 1AA3	Introductory Chemistry (3 units)	400
<b>1997-98</b>		
Chem 730a	Organic Synthesis	7
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 4D3	Organic Synthesis	7
Chem 1AA3	Introductory Chemistry (3 units)	400
<b>1996-97</b>		
Chem 730a	Organic Synthesis	7
Chem 4G6	Supervisor, Undergraduate Thesis	2

Chem 4D3	Organic Synthesis	19
Chem 1AA3	Introductory Chemistry (3 units)	400
<b>1995-96</b>		
Chem 731c	Organosilicon Chemistry	10
Chem 4G6	Supervisor, Undergraduate Thesis	3
Chem 4D3	Organic Synthesis	12
Chem 1AA3	Introductory Chemistry (3 units)	400
TSM 4A2	Theme School on New Materials (2 units, Overload), Seminar Course	25
<b>1994-95</b>		
Chem 730a	Organic Synthesis	12
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 4D3	Organic Synthesis	12
Chem 1A6	Introductory Chemistry (3 units)	400
<b>1993-94</b>		
Chem720a, 721	Molecular Modelling -	1
a special double module offered to a Masters of Teaching student, overload (unpaid)		
Chem 730a	Organic Synthesis	12
Chem 731c	Organosilicon Chemistry, Overload	10
Chem 1A6	Introductory Chemistry (3 units)	400
Chem 4G6	Supervisor, Undergraduate Thesis	3
Chem 4D3	Organic Synthesis	15
<b>1992-93</b> (University of Amsterdam, sabbatical leave)		
Graduate Course	Fundamentals of Organosilicon Chemistry	6
<b>1991-92</b>		
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 730d	Transition Metals/Organic Synthesis	8
Chem 2D3	Organic Chemistry, Overload	125
Chem 3D3	Organic Chemistry	40
<b>1990-91</b>		
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 730a	Organic Synthesis	12
Chem 2D3	Organic Chemistry, Overload	125
Chem 721	Organic Colloquium (Organizer)	20
Chem 3D3	Organic Chemistry	40
<b>1989-90</b>		
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 721	Organic Colloquium (Organizer)	20

Chem 3D3	Organic Chemistry	50
Chem 731c	Organosilicon Chemistry	40
<b>1988-89</b>		
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 720b	Molecular modelling	10
Chem 3D3	Organic Chemistry	40
<b>1987-88</b>		
Chem 4G6	Supervisor, Undergraduate Thesis	2
Chem 720a	Computers in organic chemistry	12
Chem 730a	Synthesis	12
<b>1986-88</b>		
Chem 206	Polymer Section	35
<b>1986-87</b>		
Chem 705	Computers in organic chemistry	12
Chem 4G6	Supervisor, Undergraduate Thesis	2
<b>1985-86</b>		
Chem 208	Polymer Section	35
Chem 705	Synthesis, 4 lectures	20
Chem 4G6	Supervisor, Undergraduate Thesis	1

### **Thesis Committees**

#### **External Referee**

<u>Student</u>	<u>Supervisor</u>	<u>Institution</u>	<u>Degree</u>	<u>Year</u>
Alexandra Bartole	Dr. I. Manners	University of Toronto	Ph.D.	2005
Jessie Zhang	Dr. R. Kluger	University of Toronto	Ph.D.	2005
Nicola Lake	Dr. J. Ralston	Ian Wark Institute, University	Ph.D.	2004
Claire Minard-Basquin	Dr. C. Chaix	of South Australia, Adelaide	Ph.D.	2000
	Dr. C. Pichot	École Normale Supérieure		
Sandjeevi-Ranganathan, S.	Dr. R. Whitney,	Lyon		
	Dr. W. Baker	Queen's University	Ph.D.	1998
Matuana-Molanda, L.	Dr. J. Balatinezcz	University of Toronto	Ph.D.	1997

Vlad, F.-I. 1997	Dr. A. Rudin	University of Waterloo	Ph.D.
Jihai Ma 1996	Dr. T. Tidwell	University of Toronto	Ph.D.
Andrea Dalacu 1994	Dr. M. F. Richardson	Brock University	M.Sc.
Umesh R. Parshotam 1993	Dr. Kim Baines	University of Western Ontario	Ph.D.
Flores Rutjes 1993	Dr. Henk Hiemstra	Universiteit van Amsterdam	Ph.D.
Lucy Lolkema 1993	Prof. Nico Speckamp Dr. Henk Hiemstra	Universiteit van Amsterdam	Ph.D.
Wim Jan Koot 1993	Prof. Nico Speckamp Dr. Henk Hiemstra	Universiteit van Amsterdam	Ph.D.
Louis Plamondon 1988	Prof. Nico Speckamp Dr. J. Wuest	Université de Montréal	Ph.D.
Peter Tai Wah Cheng 1988	Dr. S. MacLean	University of Toronto	Ph.D.

# **McMaster**

<u>Student</u>	<u>Supervisor</u>	<u>Degree</u>	<u>Year</u>
Greg Bahun	Dr. A. Adrononv	Ph.D.	
Xiangchun Yin	Dr. H. Stover	Ph.D.	
Tina Guenther	Dr. J. Valliant	Ph.D.	
Adrienne Pedrich	Dr. P. Harrison	Ph.D.	
John Kaldis	Dr. M. J. McGlinchey	Ph.D.	
Ju Zhang	Dr. R. H. Pelton	Ph.D.	
Rahime Benhabbour	Dr. A. Adrononv	Ph.D.	
Sreedhar Cheekoori	Dr. J. McNulty	M.Sc.	
Ken Rilling 2005	Dr. J.M. Dickson	Ph.D.	
Travis Besanger 2005	Dr. J. Brennan	Ph.D.	
Yaling Xu 2005	Dr. R. H. Pelton	Ph.D.	
Sanela Martic 2005	Dr. M. Brook	M.Sc.	

## *An Investigative Study Of Silicon-Based Materials as Alternative Matrices for Maldi-TOF Applications*

X. Sui 2005	Dr. J. D. Brennan	M.Sc.
----------------	-------------------	-------

Bola Sogbein 2005	Dr. John Valliant	Ph.D.
Ilena Dumbrava 2005	Dr. W. Leigh	M.Sc.
Amro Ragheb 2005	Dr. M. A. Brook	Ph.D.
<i>Controlling Protein-Silicone Interactions by the Modification of Silicone Elastomers with Poly(ethylene oxide)</i>		
Paul Zelisko 2004	Dr. M. A. Brook	Ph.D.
<i>The interaction of proteins with functionalized silicones</i>		
Masaaki Amako 2004	Dr. M. A. Brook	Ph.D.
<i>Synergy of Polydimethylsiloxanes and Late Transition Metal Complexes</i>		
Tom Owens 2004	Dr. W. J. Leigh	Ph.D.
Jiahong Tan 2004	Dr. J. Brash	Ph.D.
Jacques Archambeault 2002	Dr. J. Brash	Ph.D.
Maggie Wang 2002	Dr. R. F. Childs	M.Sc.
Guodong Zheng 2002	Dr. H. D. H. Stover	Ph.D.
Xioashong Lu 2001	Dr. J. Warkentin	Ph.D.
Mustafa Mohamed 2001	Dr. M. A. Brook	Ph.D.
Sonya Balduzzi 2001	Dr. Michael Brook	Ph.D.
<i>Reactive Silyl Protecting Groups</i>		
Brandi Meeks 2001	Dr. H. Sheardown	M.Sc.
Ahmed Alzamly withdrawn	Dr. M. A. Brook	Ph.D.-
Frank J. LaRonde 2000	Dr. M. A. Brook	Ph.D.
<i>C<sub>2</sub>-symmetric ligands</i>		
Sudarshi Regismond 2000	Dr. F. Winnik	Ph.D.
Rodica Stan 1999	Dr. Michael Brook	Ph.D.
<i>Synthesis of Novel Silicones and Silanes for Interface Control</i>		
Vasiliki Bartzoka 1999	Dr. Michael Brook	Ph.D.

<i>Silicone Protein Interactions</i>		
Mark Stradiotto	Dr. Michael Brook	Ph.D.
1999		
	(co-supervised with with M. J. McGlinchey)	
<i>The Dynamics and Reactivity of <math>\eta^1</math>-Indenyl Complexes</i>		
Christine Braderic	Dr. W.J. Leigh	Ph.D.
1998		
Karen Moffat	Dr. H. Stöver	Ph.D.
1998		
Suzie Rigby	Dr. M. McGlinchey	Ph.D.
1997		
Stephen Urquhart	Dr. A. Hitchcock	Ph.D.
1997		
<i>Paul Charpentier Metallocene-catalyzed semi-batch and continuous polymerization of ethylene</i>		
	Dr. A. Hamielec	Ph.D.
1997		
	Dr. M. A. Brook	
<i>Ralph Ruffolo Silanes and Allylsilanes as Possible Precursors for Transition Metal Metal-stabilized Silylium Ions</i>		
	Dr. M. A. Brook	Ph.D.
1997		
	Dr. M.J. McGlinchey	
Howard Ketelson	Dr. M. A. Brook	Ph.D.
1996		
	Dr. R. H. Pelton	
<i>The Colloidal Stability and Surface Chemistry of Stöber Silica</i>		
David Valentini	Dr. M. A. Brook	M.Sc.
1996		
<i>Silicon-Modified Starch Composites</i>		
Courtney Henry	Dr. M. A. Brook	Ph.D.
1994		
<i>Exploring the Synthetic Utility of Vinyldichlorosilanes and Vinylarylsilanes</i>		
Graham McGibbon	Dr. J. K Terlouw	Ph.D.
1994		
Tom Stefanac	Dr. M. A. Brook	M.Sc.
1994		
<i>Silane Based Radical Polymerization: Functionalized Homopolymers and Copolymers</i>		
Mike Roth	Dr. M. A. Brook	M.Sc.
1994		
<i>Controlled Formation of New Si-based Materials</i>		
Sengen Sun	Dr. P. Harrison	Ph.D.
1994		

Kai Li 1994	Dr. H. D. H. Stöver	Ph.D.
Carol Dallaire 1992	Dr. M. A. Brook	Ph.D.
<i>Study of 1-Methylated-2-trimethylsilyl Cations: An Examination of the <math>\beta</math>-Effect for Silyl, Germyl and Stannyl Groups</i>		
Andrea Osterroth 1991	Dr. M. A. Brook	M.Sc.
<i>Poly(methyl methacrylate) Sterically Stabilized by Silicone</i>		
Weifeng Yu 1991	Dr. R.H. Pelton Dr. M. A. Brook	M.Sc.
<i>The Roles of Ligands on Silicon</i>		
Thomas Sebastian 1990	Dr. M. A. Brook	M.Sc.
<i>Trichlorosilylstyrene Oligomers</i>		
<b>Defense Only</b>		
Ed Ng 2005	Dr. H. Jain, Business	Ph.D.
Young-Min Kim 2005	Dr. J. MacGregor, Chem. Eng.	Ph.D.
Damian Jankowicz (Chair) 2004	Dr. S. Becker, Psychology	Ph. D.
Michelle Vosburgh (Chair) 2004	Dr. J. Weaver, History	Ph. D.
Beata Gajewski (Chair) 2004	Dr. M. Jordana, Medical Sciences	Ph.D.
Tim Jacobs (Chair) 2003	Dr. J. Ferns, English	Ph.D.
Lina Liu 2003	Dr. H. Sheardown, Chem. Eng.	M.Sc.
Abhaya Kulkarni 2003	Dr. M. Boyle	Ph.D.
Millman, J. (Chair) 2003	Dr. D. Andrews	Ph.D.
Pauli Kavalakatt M.Sc.	Dr. H. D. H. Stöver, Chem. 2002	
Youqing Shen 2001	Dr. S. Zhu, Chem. Eng.	Ph.D.
Nekmohamed Manji Ph.D.	Dr. C. Nahmias, Med. Phys. 2001	
Linda Li M.Sc.	Dr. R. Pelton, Chem. Eng. 2001	

Iva Matkovic 2001	Dr. K. Dunbabin, History	Ph.D.
Bruce Wilson 2001	Dr. B. Baetz, Civil Eng.	Ph.D.
Brandi Meeks 2001	Dr. H. Sheardown, Chem. Eng.	M.Sc.
Leslie Ritchie 2000	English	Ph.D.
Stevens, Ronald (Chair) 2000	Dr. Weitz, Med. Sci.	Ph.D.
Downey, Jeff 2000	Dr. H. Stöver,	Ph.D.
Martin, W. 1999	Dr. A. Hrymak	M.Sc.
MacKay, Geoff (Chair) 1999	Dr. G. Wright,	Ph.D.
Arida, F. (Chair) 1998	Dr. M. Elbastawi, Mech. Eng.	Ph.D.
Marriott, Michael (Chair) Ph.D.	Dr. B. Milliken, Psychology 1998	
Wu Chen, Iris (Chair) 1998	Dr. M. Blajchman, Medical Sciences	Ph.D.
Barker, S. 1997	Dr. G. Purdy, Mat. Sci. & Eng.	Ph.D.
Wauben, I. 1997	Dr. S. Atkinson, Nutrition	Ph.D.
Marc Webster 1996	Dr. Muller, Biology	Ph.D.
Hua Guo 1995	Dr. A. Hamielec	Ph.D.
Hui Teng Er 1995	Dr. J. Warkentin	M.Sc.
Naomi Laing Ph.D.	Dr. W. Chan, Biochemistry 1994	
Darryl Scott Pickering 1992	Dr. L. P. Niles, Neurosciences	Ph.D.
Greg Sluggett 1993	Dr. W. J. Leigh	Ph.D.
Nien Nguyen 1991	Dr. W. J. Leigh	M.Sc.
William Mills 1990	Dr. B. E. McCarry	M.Sc.
J. Paul Santerre 1990	Dr. J. Brash, Chemical Engineering	Ph.D.

Charles Younger 1990	Dr. R.A. Bell	M.Sc.
William Gunn withdrawn	Dr. N.H. Werstiuk	Ph.D.
Lynn M. Cameron 1990	Dr. D.B. MacLean	M.Sc.
Michel B.M. Mangion 1990	Dr. G.P. Johari, Materials Science	Ph.D.
Richard Perrier 1989	Dr. M. J. McGlinchey	Ph.D.
J. Douglas McCallion 1986	Dr. J. Warkentin	M.Sc.

### **Committee and Association Activity**

#### **McMaster Committees**

	<b>Position</b>	<b>Year</b>
Dean's Advisory Committee	Member	2005
Science/Engineering Promotion/Tenure Committee	Member	2005-
2008		
Teaching and Learning Grants Assessment Committee	Member	2005
Intellectual Property Board	Member	1998-
2003		
Selection Committee, Associate Dean of Science	Member	2002
Faculty of Science Undergraduate Curriculum and Calendar	Member	1998,
2000-01		
Health Sciences Admissions Committee	Member	1998
McMaster Patent Board	Member	1996-98
President's Task Force on Support of Research at McMaster	Member	1996
Selection Committee, Dean of Science	Member	1995
Dean's Advisory Committee on Computing	Member	1994-96
Faculty Health Sciences Graduate Admissions/Study Committee	Member	1995-98
Graduate Curriculum and Policy Committee	Member	1994-7
Salary Anomaly Adjustment Committee Faculty of Science	Member	1991
Graduate Reviewing Committee Faculty of Science	Member	1990-92
Hiring Committee, CIS Science Coordinator	Member	1989
Ad Hoc Committee on Research and Senior Undergraduate Computing Research Needs	Member	1989
McMaster-IBM Cooperative Project	Member	1988-89

#### **Departmental Committees**

Departmental Advisory Committee	Member	2005-
2006		
Nanomaterials Committee (CFI)	CoChair	2005
Undergraduate Reviewing Committee	Member	2005-06
Implementation of CHEM3LI3	Member	2003

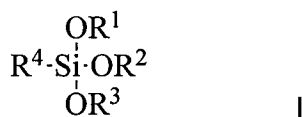
Departmental Advisory Committee 2002	Member	2001-
Computing Facility Committee 2002	Member	2001-
Accreditation Committee 2002	CoChair	2001-
Undergraduate Curriculum and Calendar Committee	Chair	2000-02
Freshman Committee	Member	2000-01
Graduate Curriculum Committee	Member	2000-01
Undergraduate Curriculum and Calendar Committee	Chair	1998
Year One Frosh Week (gave lecture)		1998
Chemistry Computer Committee	Member	1998
Organic Comprehensives Coordinator	Chair	1996-98
Teaching Associates Coordinator	Chair	1996-97
Chemistry Chair Selection Committee	Member	1995
Departmental Advisory/P&T Committee	Member	1994-96
Departmental Seminars	Chair	1993-96
X-ray Facility Users Committee	Member	1993-94
Graduate Curriculum Committee	Member	1993-94
Comprehensive Exam Coordinator	Chair	1992
Facilities Committee	Member	1991-92
Departmental Advisory Committee	Member	1989-93
Departmental Computer Users Committee	Member	1991
X-ray Facility Users Committee	Member	1991-92
Selection of X-Ray Facility Manager	Member	1990-91
Graduate Recruiting	Chair	1987-90
Graduate Reviewing	Chair	1987-92
IBM Submission for Masters in Computer Chemistry	Member	1986-88
Graduate Curriculum	Member	1986-87
Undergraduate CIC Student Advisor	Chair	1986-88
Chemistry Club Faculty Advisor	Chair	1986-87
Safety Committee	Member	1985-86
Facilities Committee	Member	1985-87

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## EXHIBIT B

1. (Previously amended) A method of preparing siliceous materials comprising combining an organic polyol silane precursor with one or more additives under conditions suitable for hydrolysis and condensation of the precursor to a siliceous material, wherein the one or more additives are selected from one or more water-soluble polymers and one or more trifunctional silanes of Formula I:



wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide Si-OH groups; and R<sup>4</sup> is group that is not hydrolyzed under normal sol-gel conditions, wherein the conditions suitable for hydrolysis and condensation of the precursor to a siliceous material comprise combining the organic polyol silane precursor with the one or more additives at a pH in the range of about 4 to about 11.5.

2. (Original) The method according to claim 1, wherein the one or more additives are water soluble polymers selected from one or more of polyethers, polyalcohols, polysaccharides, poly(vinyl pyridine), polyacids, polyacrylamides and polyallylamine.

3. (Original) The method according to claim 2, wherein the one or more additives are water soluble polymers selected from one or more of polyethylene oxide (PEO), polyethylene glycol (PEG), amino-terminated polyethylene oxide (PEO-NH<sub>2</sub>), amino-terminated polyethylene glycol (PEG-NH<sub>2</sub>), polypropylene glycol (PPG), polypropylene oxide (PPO), polypropylene glycol bis(2-amino-propyl ether) (PPG-NH<sub>2</sub>), polyvinyl alcohol, poly(acrylic acid), poly(vinyl pyridine), poly(N-isopropylacrylamide) (polyNIPAM) and polyallylamine (PAM).

4. (Original) The method according to claim 3, wherein the one or more additives are water soluble polymers selected from one or more of PEO, PEO-NH<sub>2</sub>, PEG, PPG-NH<sub>2</sub>, polyNIPAM and PAM.
5. (Original) The method according to claim 3, wherein the one or more additives are water soluble polymers selected from one or more of PEO, PEO-NH<sub>2</sub> and polyNIPAM.
6. (Original) The method according to claim 1, wherein the one or more additives is a mixture of water soluble polymers,
7. (Original) The method according to claim 6 wherein the mixture of water soluble polymers comprises PEO and PEO-NH<sub>2</sub>.
8. (Original) The method according to claim 5, wherein the one or more additives is PEO.
9. (Original) The method according to claim 8, wherein the PEO has a molecular weight that is greater than about 10,000 g/mol.
10. (Original) The method according to claim 9, wherein the PEO is used at a concentration of greater than about 0.005 g/mL of final solution.
11. (Original) The method according to claim 5, wherein the one or more additives is PEO-NH<sub>2</sub>.
12. (Original) The method according to claim 11, wherein the PEO-NH<sub>2</sub> has a molecular weight that is greater than about 3,000 g/mol and is used at a concentration of about 0.005 g/mL of final solution.

13. (Original) The method according to claim 5, wherein the one or more additives is poly(N-isopropylacrylamide).

14. (Original) The method according to claim 13, wherein the poly(N-isopropylacrylamide) has a molecular weight that is about 10,000 g/mol and is used at a concentration of about 0.005 g/mL of final solution.

15. (Original) The method according to claim 1, wherein the one or more additives is a compound of Formula I.

16. (Original) The method according to claim 15, wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and are derived from organic di- or polyols.

17. (Original) The method according to claim 16, wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and are derived from sugar alcohols, sugar acids, saccharides, oligosaccharides or polysaccharides.

18. (Previously amended) The method according to claim 16, wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and are derived from allose, altrose, glucose, mannose, gulose, idose, galactose, talose, ribose, arabinose, xylose, lyxose, threose, erythrose, glyceraldehydes, sorbose, fructose, dextrose, levulose, sorbitol, sucrose, maltose, cellobiose, lactose, dextran (500-50,000 MW), amylose, pectin, glycerol, propylene glycol or trimethylene glycol.

19. (Original) The method according to claim 18, wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and are derived from glycerol, sorbitol, maltose, trehalose, glucose, sucrose, amylose, pectin, lactose, fructose, dextrose and dextran.

20. (Original) The method according to claim 18, wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and are derived from glycerol, sorbitol, maltose or dextran.

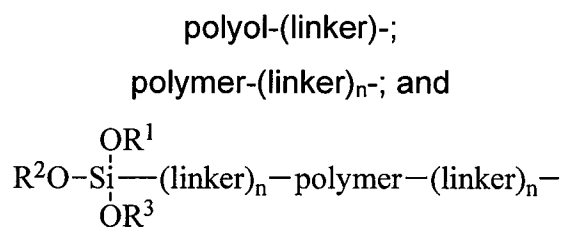
21. (Original) The method according to claim 15, wherein  $OR^1$ ,  $OR^2$  and  $OR^3$  are the same or different and are selected from  $C_{1-4}$ alkoxy, aryloxy and arylalkyleneoxy.

22. (Original) The method according to claim 21, wherein wherein  $OR^1$ ,  $OR^2$  and  $OR^3$  are the same or different and are selected from  $C_{1-4}$ alkoxy, phenoxy, naphthyloxy and benzyloxy.

23. (Original) The method according to claim 22, wherein wherein  $OR^1$ ,  $OR^2$  and  $OR^3$  are the same or different and are selected from  $C_{1-4}$ alkoxy.

24. (Original) The method according to claim 23, wherein  $OR^1$ ,  $OR^2$  and  $OR^3$  are all ethoxy.

25. (Original) The method according to claim 15, wherein  $R^4$  is selected from the group consisting of:



wherein n is 0-1.

26. (Original) The method according to claim 25, wherein the polyol is an organic di- or polyol.

27. (Original) The method according to claim 26, wherein the polyol is selected from the group consisting of a sugar alcohol, sugar acid, saccharide, oligosaccharide and polysaccharide.

28. (Original) The method according to claim 27, wherein the polyol is a selected from the group consisting of allose, altrose, glucose, mannose, gulose, idose, galactose, talose, ribose, arabinose, xylose, lyxose, threose, erythrose, glyceraldehydes, sorbose, fructose, dextrose, levulose, sorbitol, sucrose, maltose, cellobiose, lactose. dextran, (500-50,000 MW), amylose, pectin, glycerol, propylene glycol and trimethylene glycol.

29. (Original) The method according to claim 28, wherein the polyol is selected from the group consisting of glycerol, sorbitol, maltose, trehalose, glucose, sucrose, amylose, pectin, lactose, fructose, dextrose and dextran.

30. (Previously amended) The method according to claim 29, wherein the polyol is selected from the group consisting of glycerol, sorbitol, glucose, maltose and dextrose.

31. (Original) The method according to claim 25 wherein the polymer is a water soluble polymer.

32. (Original) The method according to claim 31, wherein the polymer is selected from the group consisting of polyethylene oxide (PEO), polyethylene glycol (PEG), amino-terminated polyethylene oxide (PEO-NH<sub>2</sub>), amino-terminated polyethylene glycol (PEG-NH<sub>2</sub>), polypropylene glycol (PPG), polypropylene oxide (PPO), polypropylene glycol bis(2-amino-propyl ether) (PPG-NH<sub>2</sub>), polyvinyl alcohol, poly(acrylic acid), poly(vinyl pyridine), poly(N-isopropylacrylamide) (polyNIPAM) and polyallylamine (PAM).

33. (Original) The method according to claim 32, wherein the water soluble polymer is selected from the group consisting of PEO, PEO-NH<sub>2</sub>, PEG, PPG-NH<sub>2</sub>, polyNIPAM and PAM.

34. (Original) The method according to claim 33, wherein the polymer is PEO.

35. (Original) The method according to claim 25, wherein the linker is selected from the group consisting of C<sub>1-20</sub>alkylene, C<sub>1-20</sub>alkenylene, organic ethers, thioethers, amines, esters, amides, urethanes, carbonates and ureas.

36. (Original) The method according to claim 25, wherein the compound of Formula I is selected from one or more of:

GluconamideSi (Compound 1);

MaltonamideSi (Compound 2);

DextronamideSi (Compound 3);

(CH<sub>2</sub>CH<sub>2</sub>O)<sub>p</sub>[(EtO)<sub>3</sub>Si(C<sub>3</sub>H<sub>6</sub>)]<sub>2</sub>, p ~4-5, average MW 200 (Compound 5a);

(CH<sub>2</sub>CH<sub>2</sub>O)<sub>p</sub>[(EtO)<sub>3</sub>Si(C<sub>3</sub>H<sub>6</sub>)]<sub>2</sub>, p ~13, average MW 600 (Compound 5b);

(CH<sub>2</sub>CH<sub>2</sub>O)<sub>p</sub>[(EtO)<sub>3</sub>Si(C<sub>3</sub>H<sub>6</sub>)]<sub>2</sub>, p ~44, average MW 2000 (Compound 5c); and

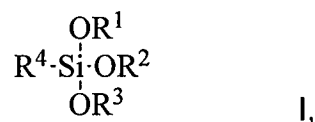
(CH<sub>2</sub>CH<sub>2</sub>O)<sub>p</sub>[(EtO)<sub>3</sub>Si(C<sub>3</sub>H<sub>6</sub>)]<sub>2</sub>, p ~227, average MW 10,000 (Compound 5d).

37. (Original) The method according to claim 1, wherein the organic polyol silane precursor is selected from the group consisting of diglycerylsilane (DGS), monosorbitylsilane (MSS), monomaltosylsilane (MMS), dimaltosylsilane (DMS) and dextran-based silane (DS).

38. (Currently Amended) The method according to claim 1, wherein the conditions suitable for the hydrolysis and condensation of the precursor to a siliceous material include a pH in the range of about 4-11.5 comprise combining the organic polyol silane precursor with the one or more additives in aqueous solutions and with optional sonication to assist in dissolution.

39. (Currently amended) A method of preparing siliceous materials with low shrinkage characteristics comprising:

(a) combining an aqueous solution of one or more compounds of Formula I:



wherein  $\text{OR}^1$ ,  $\text{OR}^2$  and  $\text{OR}^3$  are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide Si-OH groups; and  $\text{R}^4$  is group that is not hydrolyzed under normal sol-gel conditions, with an aqueous solution of an organic polyol silane precursor;

(b) adjusting the pH of the solution in (a) to about 4-11.5;

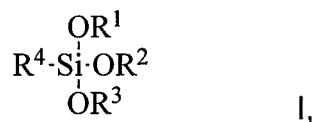
(c) allowing the solution of (b) to gel;

(d) aging the gel of (c); and

(e) drying the aged gel in air.

40. (Original) A siliceous material prepared using the method according to claim 1.

41. (Currently amended) A method of preparing monolithic silica materials comprising combining an organic polyol silane precursor with one or more additives selected from one or more water-soluble polymers and one or more compounds of Formula I:

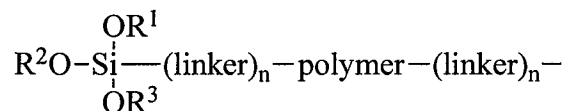


wherein  $\text{OR}^1$ ,  $\text{OR}^2$  and  $\text{OR}^3$  are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide Si-OH groups,  $\text{R}^4$  is group

selected from  $\text{polymer-(linker)}_n\text{-}$  and  $\text{R}^2\text{O-Si} \begin{array}{c} \text{OR}^1 \\ | \\ \text{OR}^3 \end{array} \text{-(linker)}_n\text{-polymer-(linker)}_n\text{-}$  and  $n = 0-1$ , under conditions where a phase transition occurs before gelation, wherein the conditions where a phase transition occurs before gelation comprise combining the

organic polyol silane precursor with the one or more additives at a pH in the range of about 4 to about 11.5.

42. (Original) The method according to claim 41, wherein  $R^4$  is



43. (Original) The method according to claim 42, wherein the linker group is a  $C_{1-4}$ alkylene group and n is 1.

44. (Original) The method according to claim 42, wherein  $OR^1$ ,  $OR^2$  and  $OR^3$  are the same and are selected from  $C_{1-4}$ alkoxy.

45. (Original) The method according to claim 42, wherein the polymer is PEO.

46. (Original) The method according to claim 41 wherein the compound of Formula I is selected from the group consisting of:

$(CH_2CH_2O)_p[(EtO)_3Si(C_3H_6)]_2$ , p ~4-5, average MW 200 (Compound **5a**);

$(CH_2CH_2O)_p[(EtO)_3Si(C_3H_6)]_2$ , p ~13, average MW 600 (Compound **5b**);

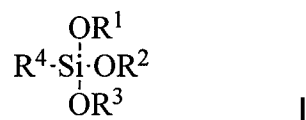
$(CH_2CH_2O)_p[(EtO)_3Si(C_3H_6)]_2$ , p ~44, average MW 2000 (Compound **5c**); and

$(CH_2CH_2O)_p[(EtO)_3Si(C_3H_6)]_2$ , p ~227, average MW 10,000 (Compound **5d**).

47. (Original) The method according to claim 41, wherein the water soluble polymer is selected from one or more of PEO, PEO-NH<sub>2</sub> and poly(NIPAM).

48. (Original) A meso/macroporous silica monolith prepared using the method according to claim 41.

49. (Currently amended) A method of preparing siliceous materials comprising combining an organic polyol silane precursor, a biomolecule of interest and one or more additives under conditions suitable for the hydrolysis and condensation of the precursor to a siliceous material, wherein the one or more additives are selected from one or more water-soluble polymers and one or more trifunctional silanes of Formula I:



wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide a Si-OH group; and R<sup>4</sup> is group that is not hydrolyzed under normal sol-gel conditions, wherein the conditions suitable for hydrolysis and condensation of the precursor to a siliceous material comprise combining the organic polyol silane precursor, biomolecule and one or more additives at a pH in the range of about 4 to about 11.5.

50. (Original) A siliceous material comprising a biomolecule entrapped therein prepared using the method according to claim 49.

51. (Previously amended) A method for the quantitative or qualitative detection of a test substance that reacts with, binds to and/or whose reactivity is catalyzed by an active biological substance, wherein said biological substance is encapsulated within a siliceous material, comprising:

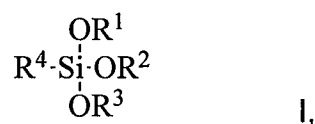
- (a) preparing the siliceous material comprising said active biological substance entrapped within a porous, silica matrix using a method according to claim 49;
- (b) bringing said biological-substance-containing siliceous material into contact with a gas or aqueous solution comprising the test substance; and
- (c) quantitatively or qualitatively detecting, observing or measuring the change in one or more characteristics in the biological substance entrapped within the siliceous

material and/or, alternatively, quantitatively or qualitatively detecting, observing or measuring the change in one or more characteristics in the test substance.

52. (Original) The method according to claim 51, wherein the change in one or more characteristics of the entrapped biological substance is qualitatively or quantitatively measured by spectroscopy, utilizing one or more techniques selected from UV, IR, visible light, fluorescence, luminescence, absorption, emission, excitation and reflection.

53. (Original) A method of storing a biologically active biological substance in a silica matrix, wherein the biological substance is an active protein or active protein fragment, wherein the silica matrix prepared using a method according to claim 49.

54. (Currently amended) A method of preparing a monolithic silica chromatographic column comprising placing a solution comprising an organic polyol silane precursor and one or more additives selected from one or more water-soluble polymers and one or more compounds of Formula I:



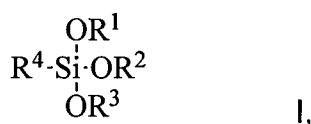
wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide a Si-OH group; R<sup>4</sup> is group

selected from polymer-(linker)<sub>n</sub>- and  $\begin{array}{c} \text{OR}^1 \\ | \\ \text{R}^2\text{O-Si-(linker)}_n\text{-polymer-(linker)}_n\text{-} \\ | \\ \text{OR}^3 \end{array}$  and n = 0-

1, in a column under conditions suitable for a phase transition to occur before gelation, wherein the conditions suitable for a phase transition to occur before gelation comprise combining the organic polyol silane precursor with the one or more additives at a pH in the range of about 4 to about 11.5.

55. (Previously amended) The method according to claim 54, wherein the solution further comprises one or more substances, which provide cationic sites that counterbalance an anionic charge of the silica to reduce non-selective interactions

56. (Currently amended) A chromatographic column comprising a silica monolith prepared by combining an organic polyol silane precursor and one or more additives selected from one or more water-soluble polymers and one or more compounds of Formula I:

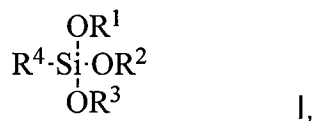


wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide Si-OH groups; R<sup>4</sup> is group

selected from polymer-(linker)<sub>n</sub>- and  $\begin{array}{c} \text{OR}^1 \\ | \\ \text{R}^2\text{O-Si-} \\ | \\ \text{OR}^3 \end{array} \text{---(linker)}_n\text{---polymer---(linker)}_n\text{---}$  and n = 0-1, under conditions where a phase transition occurs before gelation, wherein the conditions suitable for a phase transition to occur before gelation comprise combining the organic polyol silane precursor with the one or more additives at a pH in the range of about 4 to about 11.5.

57. (Currently amended) A method of preparing a monolithic silica column having an active biomolecule entrapped therein comprising combining:

- a) a polyol-silane derived silica precursor;
- b) one or more additives selected from one or more water soluble polymers and one or more compounds of Formula I:



wherein OR<sup>1</sup>, OR<sup>2</sup> and OR<sup>3</sup> are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide Si-OH groups, R<sup>4</sup> is group

selected from polymer-(linker)<sub>n</sub>- and 
$$\begin{array}{c} \text{OR}^1 \\ | \\ \text{R}^2\text{O}-\text{Si}-(\text{linker})_n-\text{polymer}-(\text{linker})_n- \\ | \\ \text{OR}^3 \end{array}$$
 and n is 0-1; and

c) a biomolecule;

under conditions wherein a phase separation occurs before gelation, wherein the conditions suitable for a phase transition to occur before gelation comprise combining the organic polyol silane precursor with the one or more additives at a pH in the range of about 4 to about 11.5.

58. (Original) The method according to claim 57, wherein the one or more additives is one or more water soluble polymers or one or more compounds of Formula I, wherein

R<sup>4</sup> is 
$$\begin{array}{c} \text{OR}^1 \\ | \\ \text{R}^2\text{O}-\text{Si}-(\text{linker})_n-\text{polymer}-(\text{linker})_n- \\ | \\ \text{OR}^3 \end{array}$$

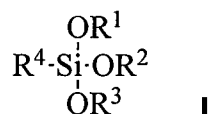
59. (Previously amended) The method according to claim 57, wherein the organic polyol silane silica precursor, one or more additives and biomolecules are also combined with a substance which provides cationic sites that counterbalance an anionic charge of the silica to reduce non-selective interactions.

60. (Original) A chromatographic column prepared using a method according to claim 57.

61. (Original) A method of performing immunoaffinity chromatography, sample cleanup, solid phase extraction or preconcentration of analytes, removal of unwanted contaminants, solid phase catalysis or frontal affinity chromatography comprising:

- (a) applying a sample to a column according to claim 60: and
- (b) performing immunoaffinity chromatography, sample cleanup, solid phase extraction or preconcentration of analytes, removal of unwanted contaminants, solid phase catalysis or frontal affinity chromatography.

62. (Previously amended) A method of preparing siliceous materials with enhanced protein stabilizing ability comprising combining an organic polyol silane precursor with one or more additives under conditions suitable for hydrolysis and condensation of precursor to a siliceous material, wherein the one or more additives is selected from one or more trifunctional silanes of Formula I:



wherein wherein  $\text{OR}^1$ ,  $\text{OR}^2$  and  $\text{OR}^3$  are the same or different and represent a group that is hydrolyzed under normal sol-gel conditions to provide a Si-OH group and  $\text{R}^4$  is polyol-(linker)-.

63. (Previously amended) The method according to claim 62, wherein the polyol in  $\text{R}^4$  is derived from sugar alcohols, sugar acids, saccharides, oligosaccharides or polysaccharides.

64. (Original) The method according to claim 63, wherein the polyol in  $\text{R}^4$  is derived from allose, altrose, glucose, mannose, gulose, idose, galactose, talose, ribose, arabinose, xylose, lyxose, threose, erythrose, glyceraldehydes, sorbose, fructose, dextrose, levulose, sorbitol, sucrose, maltose, cellobiose, lactose, dextran (500-50,000 MW), amylose, pectin, glycerol, propylene glycol or trimethylene glycol.

65. (Original) The method according to claim 64, wherein the polyol in  $\text{R}^4$  is derived from glycerol, sorbitol, maltose, trehalose, glucose, sucrose, amylose, pectin, lactose, fructose, dextrose or dextran.

66. (Original) The method according to claim 65, wherein the polyol in  $\text{R}^4$  is derived from glycerol, sorbitol, glucose, maltose or dextran.

67. (Original) The method according to claim 66, wherein the polyol in R<sup>4</sup> is derived from glucose or maltose.
68. (Previously amended) The method according to claim 62 wherein the one or more additives is GluconamideSi (Compound 1) and/or MaltonamideSi (Compound 2).
69. (Original) The method according to claim 62, wherein the protein is a kinase, luciferase, or urease or is Factor Xa.
70. (Original) The method according to claim 69, wherein the protein is Src protein tyrosine kinase.
71. (Original) The method according to claim 62, further comprising combining the organic polyol silane precursor and one or more additives with a substrate for the protein to be entrapped.
72. (Original) The method according to claim 71, wherein the protein is a kinase and the substrate is a source of phosphate.
73. (Original) The method according to claim 72, wherein the substrate is ATP.
74. (Previously added) The method according to claim 59, wherein the substance which provides cationic sites that counterbalance an anionic charge of the silica to reduce non-selective interactions is aminopropyltriethoxysilane (APTES), PAM, PPG-NH<sub>2</sub> and/or PEG-NH<sub>2</sub>.

## EXHIBIT C

Evidence is provided below to demonstrate that DGS  $\neq$  TEOS; DGS  $\neq$  TEOS + glycerol; DGS  $\neq$  PGS; DGS  $\neq$  PGS + glycerol. In all cases, a head-to-head experiment was run using PEO of 10K MW. The experimental procedures are shown below.

As can be seen from the attached scanning electron microscopy (SEM) pictures, the DGS samples 1, 5, 6 exhibit macroporosity and (not shown) mesoporosity. The morphology of the structures varies, but is in all cases open. Sample 2 is not macroporous. Under these conditions, the gelation occurred prior to phase separation. In order to slow down gelation, one equivalent of glycerol was added while other conditions were kept constant. The retarded hydrolysis rate led phase separation occurring *prior* to gelation and a macroporous structure was achieved (sample 6). To more broadly show the effect of changing the rate, 1 equiv. of glycerol was added to all of DGS, TEOS and PGS systems (samples 5, 6, 7, 8 11 and 12). As can be clearly seen, under these conditions only DGS at either pH 5.5 or pH 11 led to macroporous structures, while TEOS and PGS did not.

The SEM pictures of TEOS derived silica show that macroporous structures are not formed: with glycerol present, a 2 phase system results that does not cure within 1 day.

PGS does not lead to macroporous silica, irrespective of the presence of glycerol.

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Procedure: Sample 1: **DGS** (1.00 g, 4.71 mmol) was dissolved in H<sub>2</sub>O (1000  $\mu$ L) at 0 °C with sonication for 20 min. An aqueous solution of HEPES buffer (1000  $\mu$ L) at 50 mM, pH 5.5 (sample 1) (or pH 11 (sample 2)) containing 16% PEO (MW=10,000) (w/v) was added and mixed. The mixture was allowed to stand at room temperature to gel. Phase separation and gelation occurred after 2 min (sample 1) and 3 min (sample 2), respectively, to give an opaque hydrogel. The gel was aged at 4 °C overnight, followed by aging at room temperature for 2 days. After washing with H<sub>2</sub>O (each time 10 mL x 5 times), and drying in air at room temperature for 1 week, an opaque xerogel was obtained. Samples 2 (pH 11), 5 and 6 were prepared similar to sample 1, reaction conditions are listed in Table 1. For 5 and 6, 1 equivalent of glycerol (to DGS) was added to DGS aqueous solution.

Sample 3: **TEOS** (0.98 g, 4.71 mmol) was mixed with H<sub>2</sub>O (1000  $\mu$ L) and sonicated at 0 °C for 20 min. An aqueous solution of HEPES buffer (1000  $\mu$ L) at 50 mM, pH 5.5 (sample 3, pH 11, sample 4) containing 16% PEO (MW=10,000) (w/v) was added and stirred at room temperature for another 20 min. The mixture was allowed to stand at room temperature for 30 min, two solution layers formed and after 1 day there was a small amount of white solid precipitate which was collected by centrifugation, washed with H<sub>2</sub>O and dried in air. Samples 4, 7 and 8 were prepared similar to sample 1, reaction conditions are listed in Table 1. For 7 and 8, 1 equivalent of glycerol (to TEOS) was added. In sample 4, a very small amount of white precipitate formed in the interface of two layers after standing at room temperature for 1 day, which was collected by centrifugation, washed with H<sub>2</sub>O and dried in air.

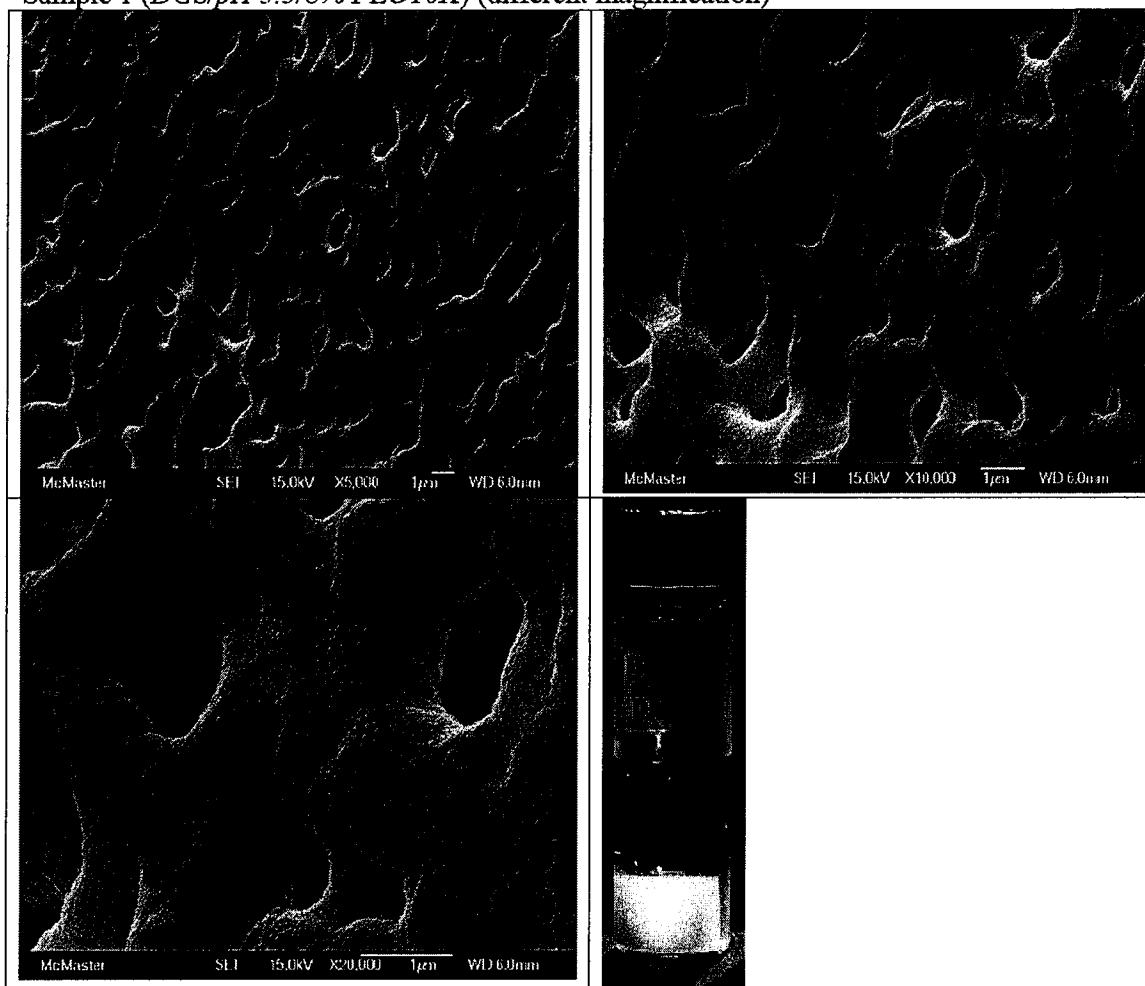
Samples **9** and **10**: **PGS** was prepared according to the literature (Gill, J. Am. Chem. Soc. 1998, 120, 8587-8598). It was found that PGS is not fully soluble in H<sub>2</sub>O. The mixture of PGS (5.00 g) and H<sub>2</sub>O (5000  $\mu$ L) was sonicated at 0 °C for 20 min, and filtered; an insoluble solid (1.17 g) remained. In order to keep the ratio of Si:H<sub>2</sub>O:PEO consistent with the DGS and TEOS system, to the filtrate was added H<sub>2</sub>O (1420  $\mu$ L). Thus, this prehydrolyzed PGS solution contained 0.6 g (4.71) mmol of PGS in 1000  $\mu$ L H<sub>2</sub>O. Sample **9** and **10** then were prepared similar to sample **1** and **2**, reaction conditions are listed in Table 1. For 11 and 12, 1 equivalent of glycerol (to PGS) was added to the PGS aqueous solution.

**Table 1. Reaction condition for preparation of silica monolith.**

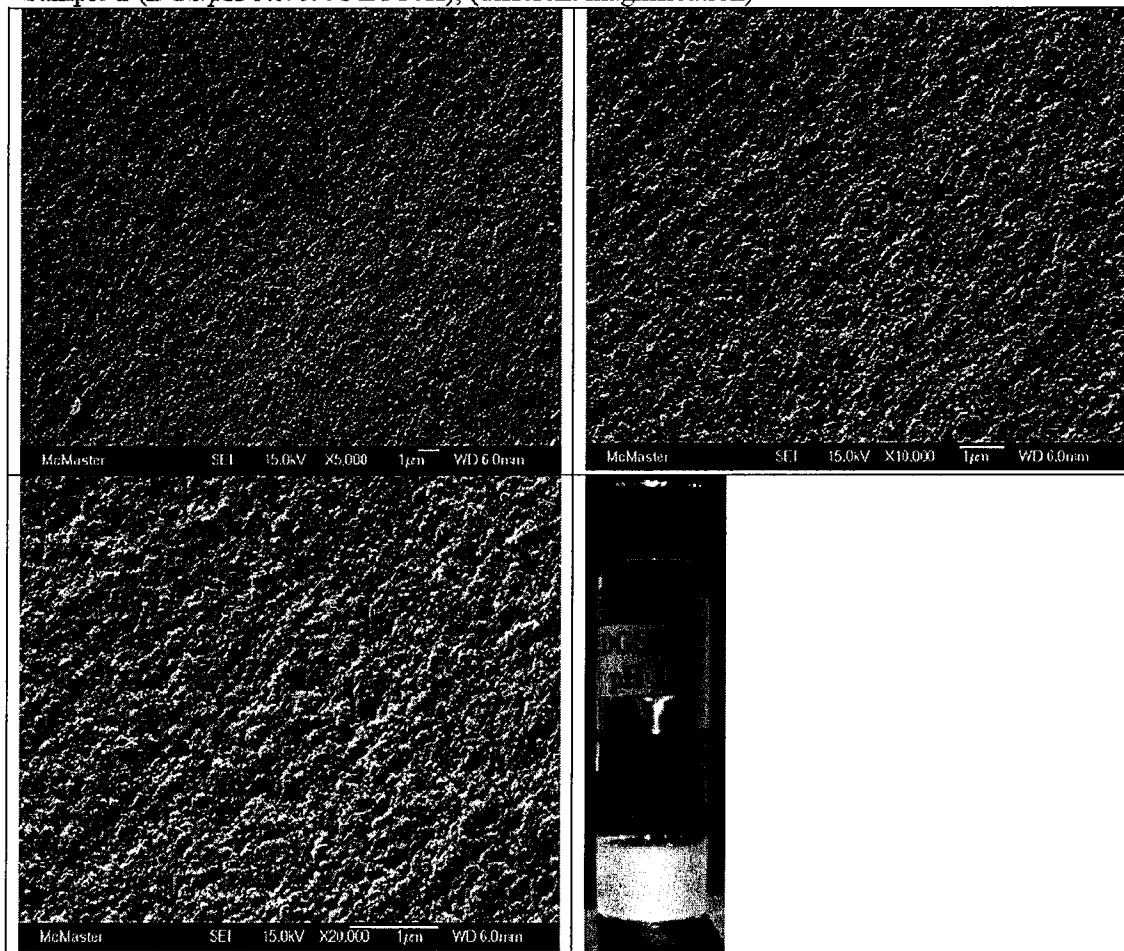
Sample	DGS, g (mmol)	TEOS, g (mmol)	PGS G(mmol)	Additional glycerol g(mmol)	HEPES buffer (original 50mM), containing 16% w/v, PEO-10K	
					pH 5.5	pH 11
1	1.00 (4.71)				1 mL	
2	1.00 (4.71)					1 mL
3		0.98 (4.71)			1 mL	
4		0.98 (4.71)				1 mL
5	1.00 (4.71)			0.433(4.71)	1 mL	
6	1.00 (4.71)			0.433(4.71)		1 mL
7		0.98 (4.71)		0.433(4.71)	1 mL	
8		0.98 (4.71)		0.433(4.71)		1 mL
9			0.60 (4.71)		1 mL	
10			0.60 (4.71)			1 mL
11			0.60 (4.71)	0.433(4.71)	1 mL	
12			0.60 (4.71)	0.433(4.71)		1 mL

# SEM images

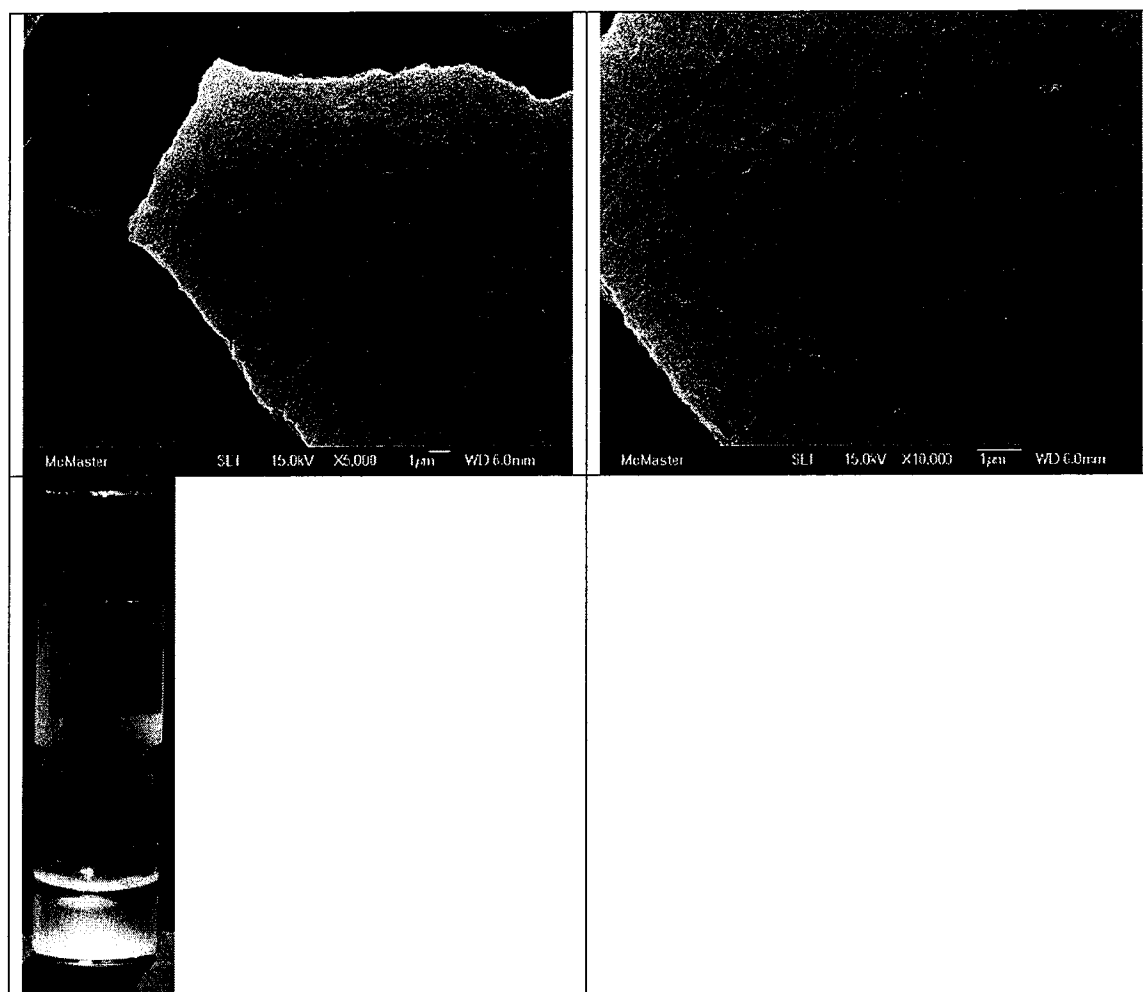
Sample 1 (*DGS/pH 5.5/8% PEO10K*) (different magnification)



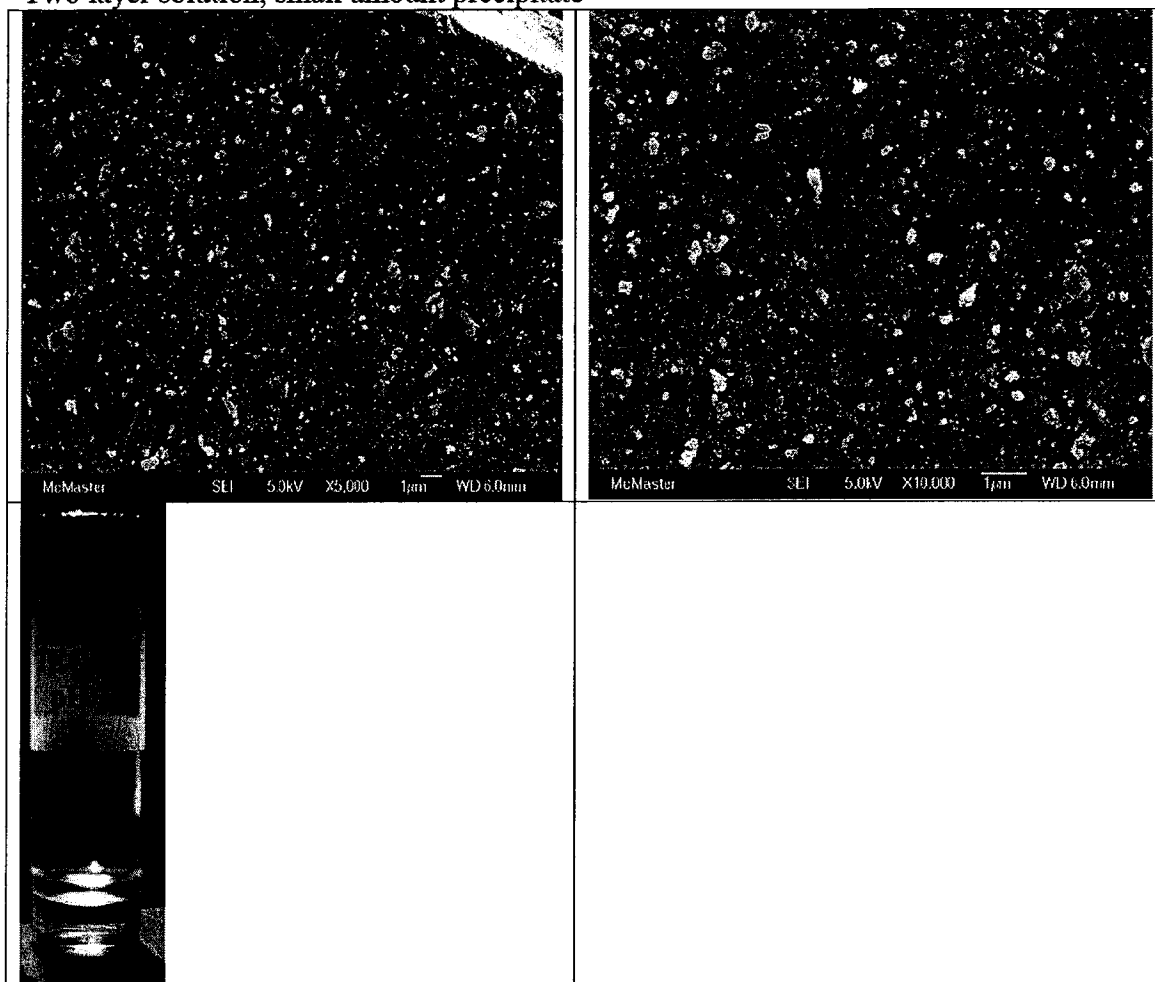
Sample 2 (DGS/pH 5.5/8% PEO10K), (different magnification)



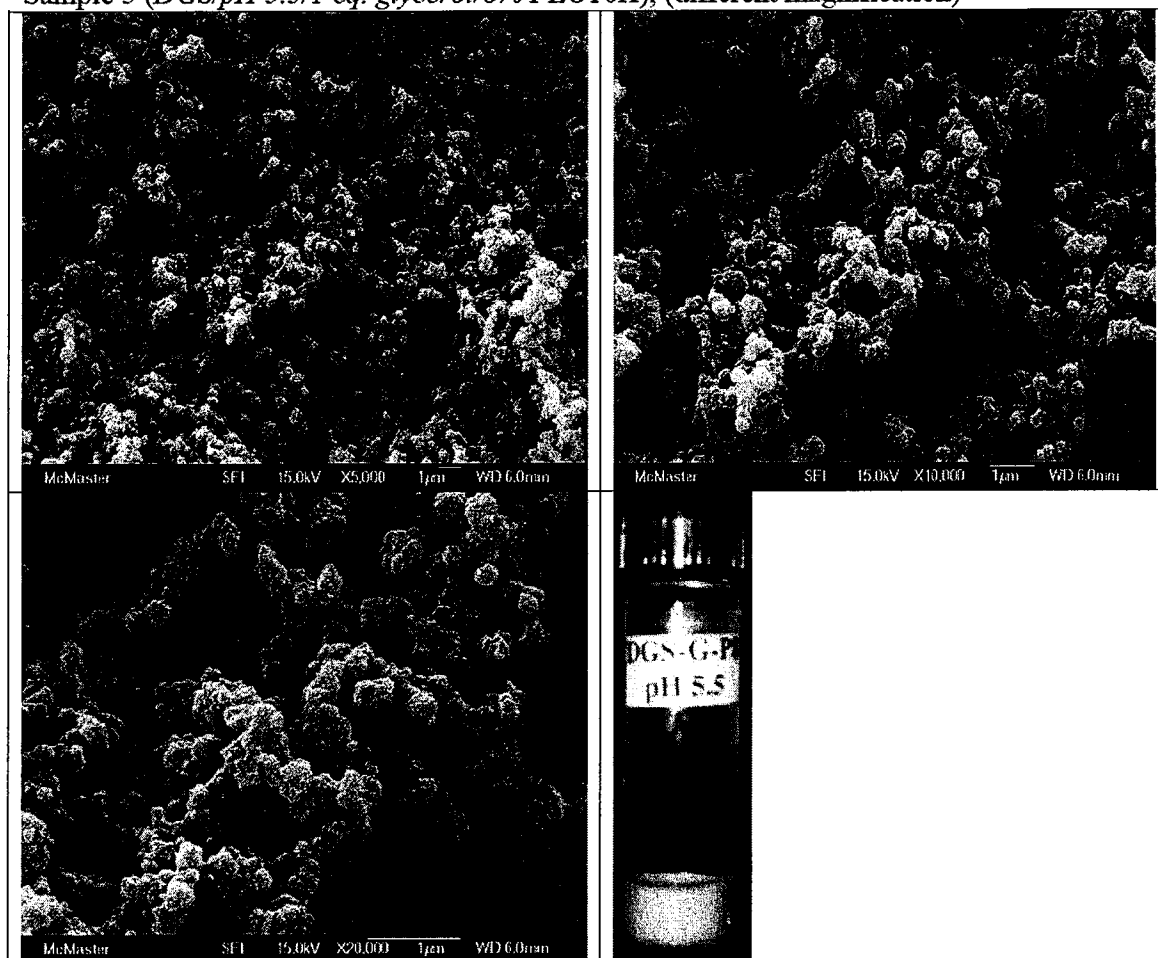
Sample 3 (*TEOS/pH 5.5/8% PEO10K*), (different magnification)  
Two layer solution, small amount precipitate



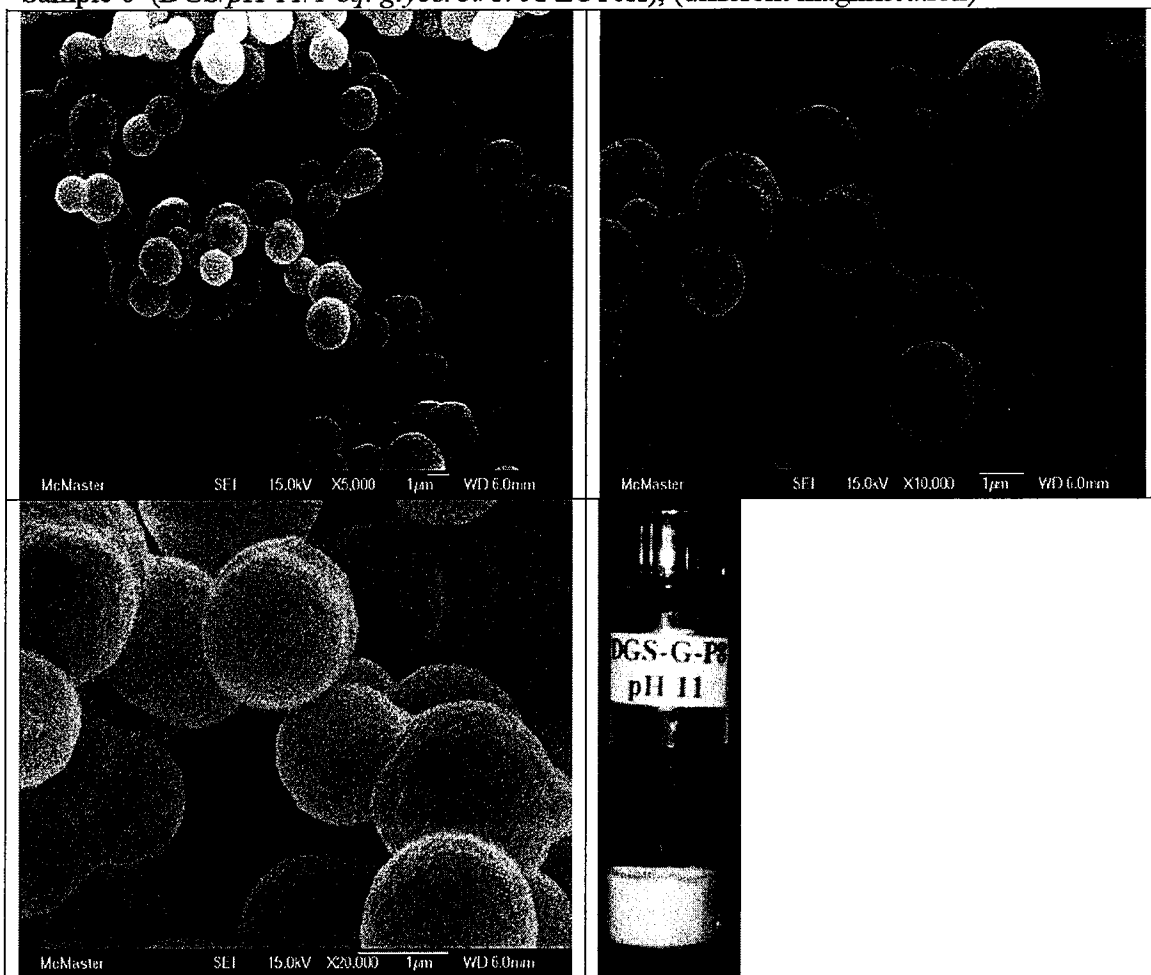
Sample 4 (*TEOS/pH 11/8% PEO10K*), (different magnification)  
Two layer solution, small amount precipitate



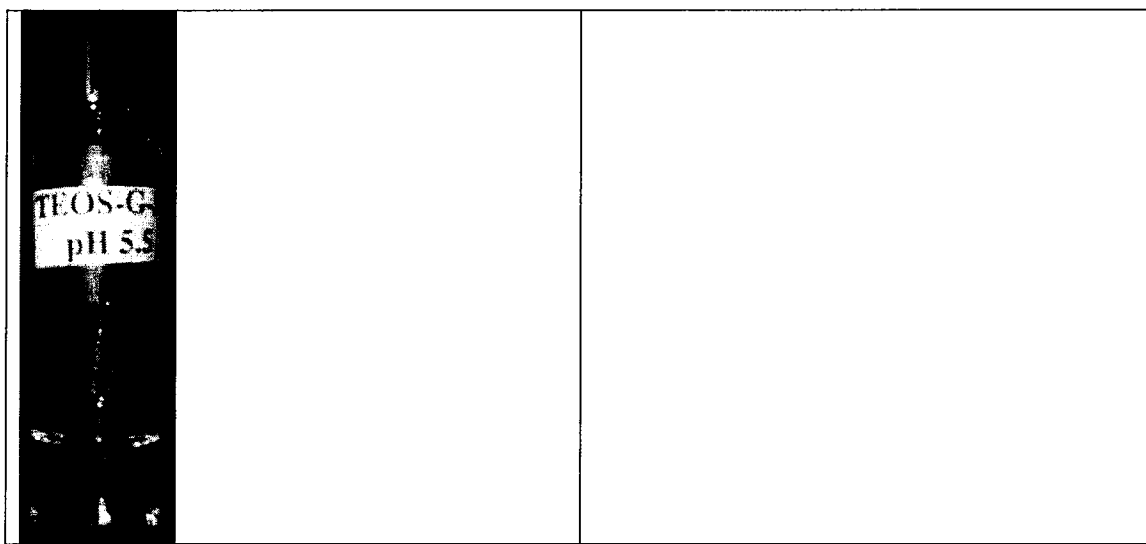
Sample 5 (*DGS/pH 5.5/1 eq. glycerol/8% PEO10K*), (different magnification)



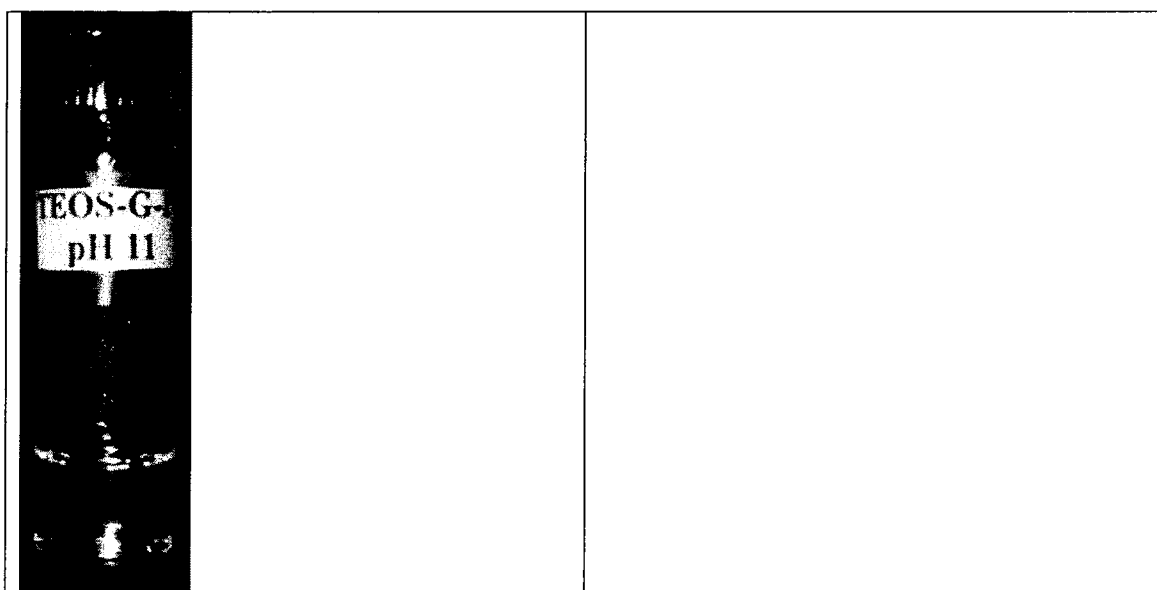
Sample 6 (*DGS/pH 11/1 eq. glycerol/8% PEO10K*), (different magnification)



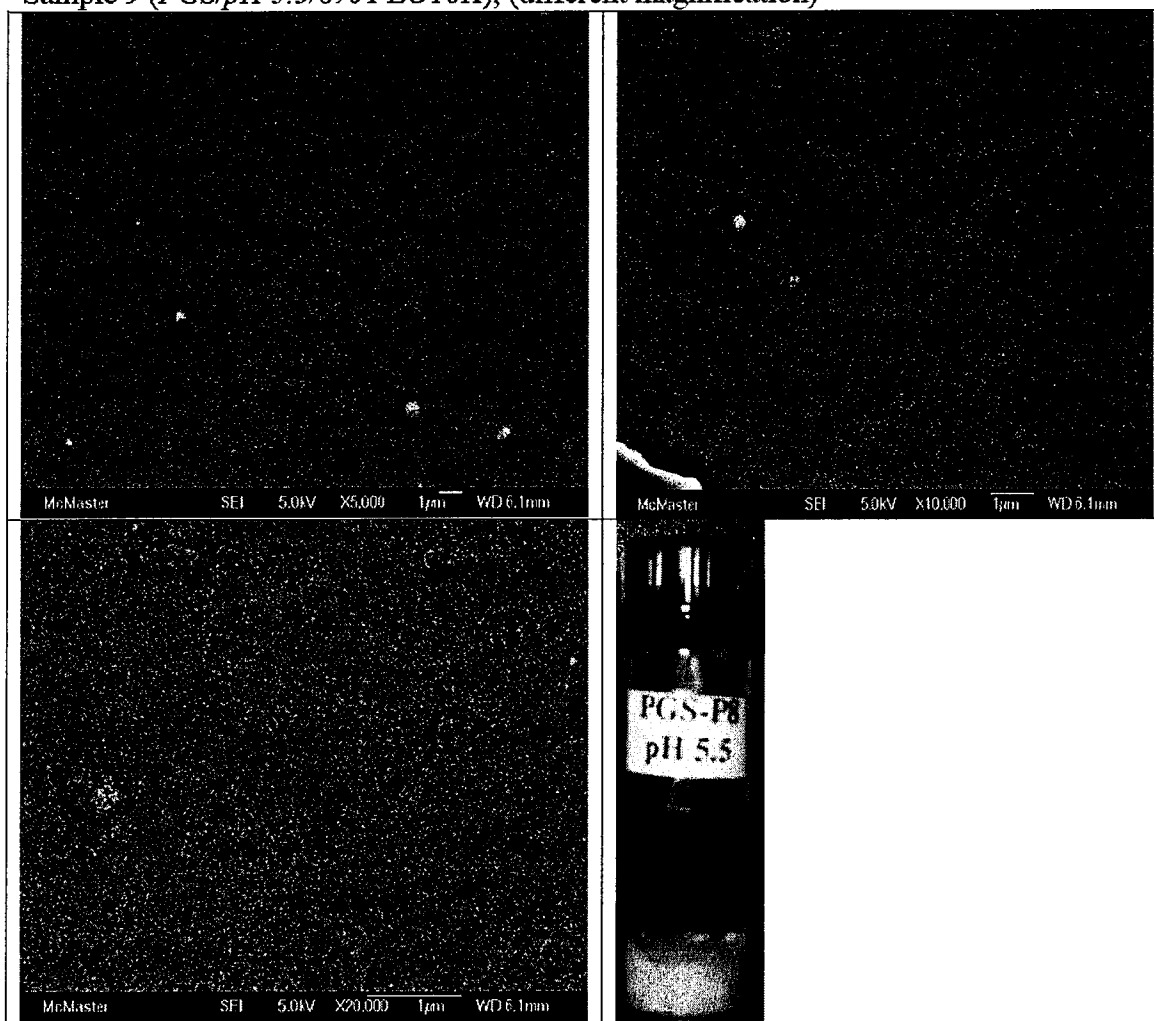
Sample 7 (*TEOS/pH 5.5/1 eq. glycerol/8% PEO10K*), Two layer solution, SEM is not available



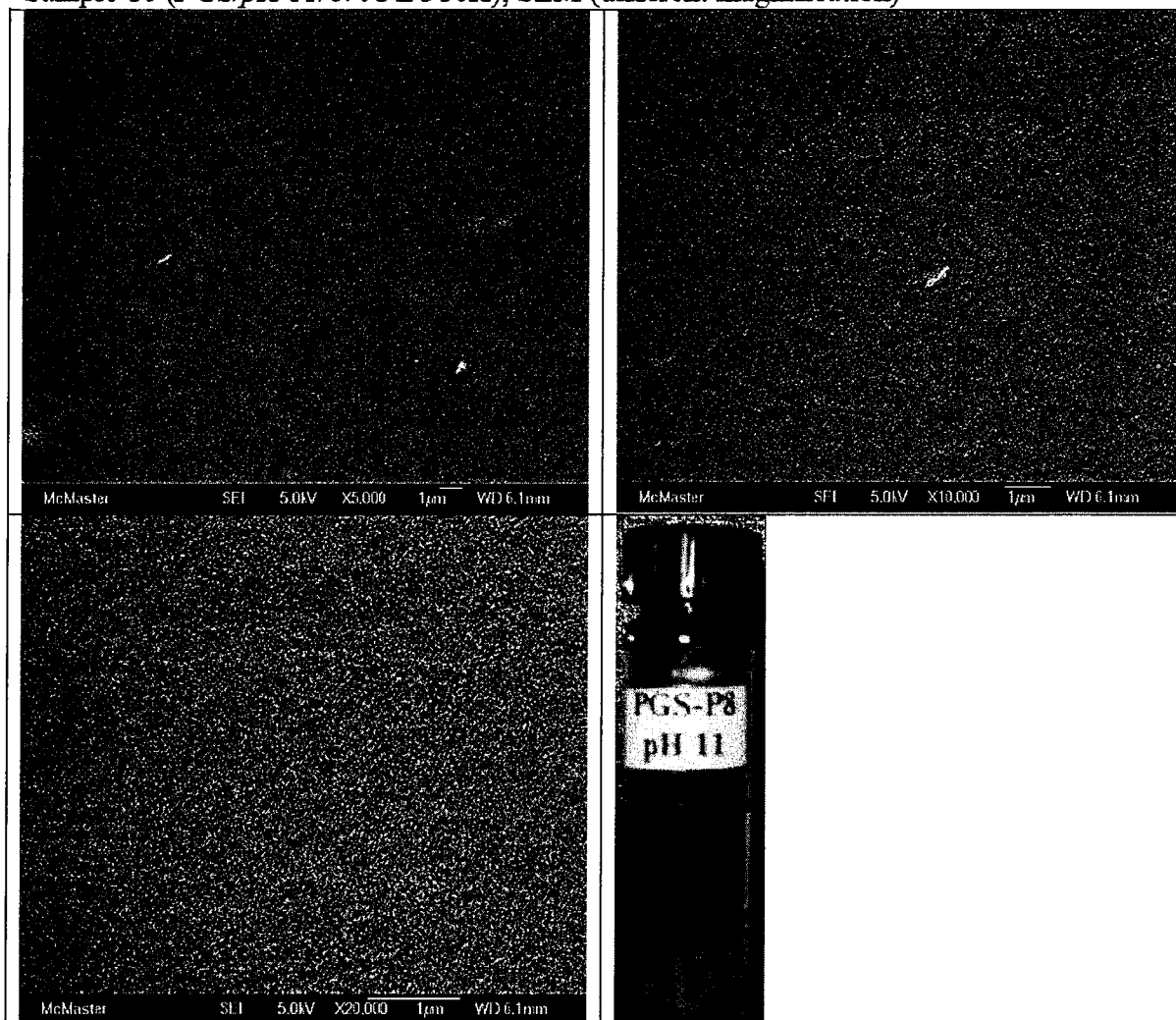
Sample 8 (*TEOS/pH 11/1 eq. glycerol/8% PEO10K*)  
Two layer solution, SEM not available



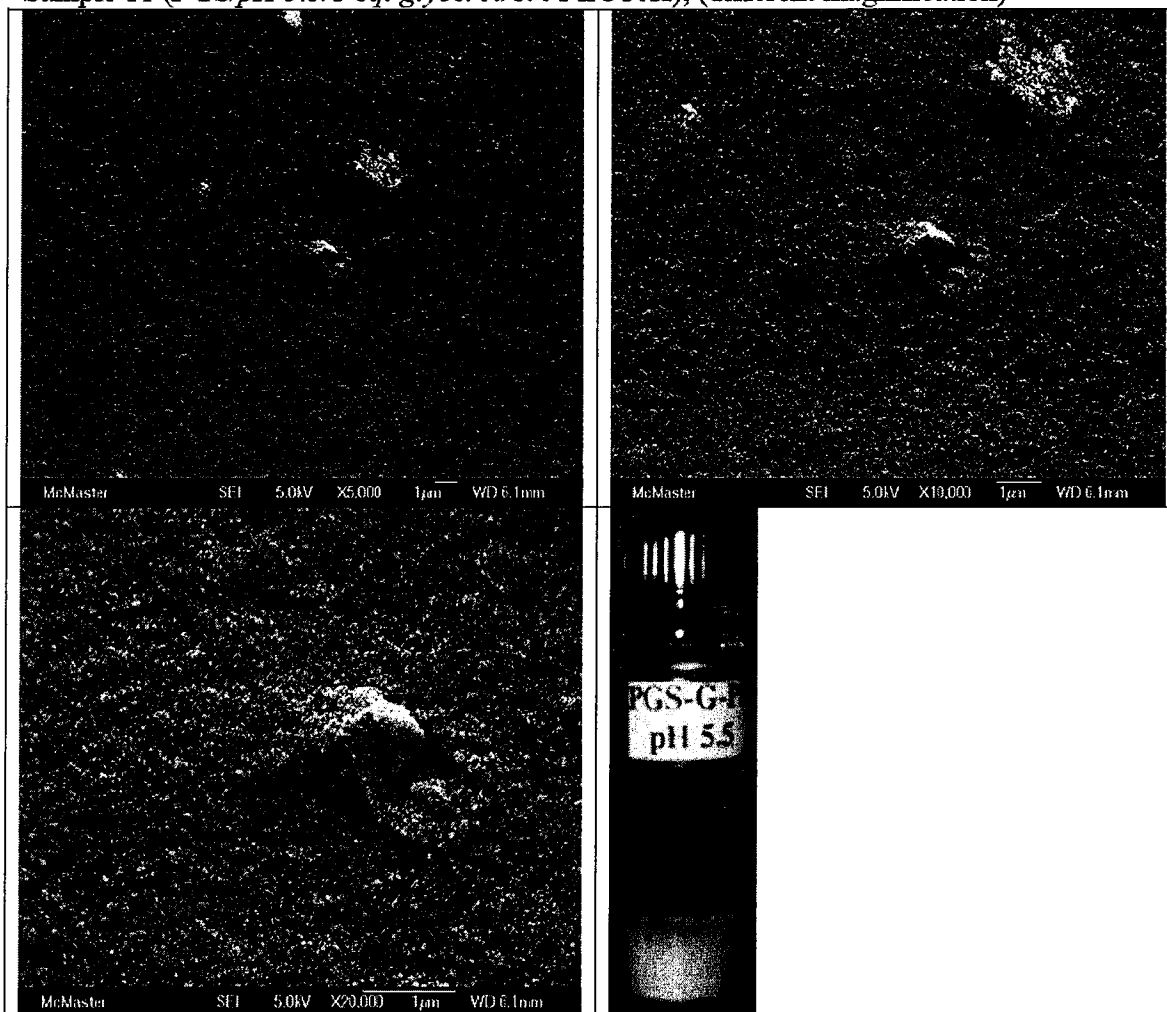
Sample 9 (*PGS/pH 5.5/8% PEO10K*), (different magnification)



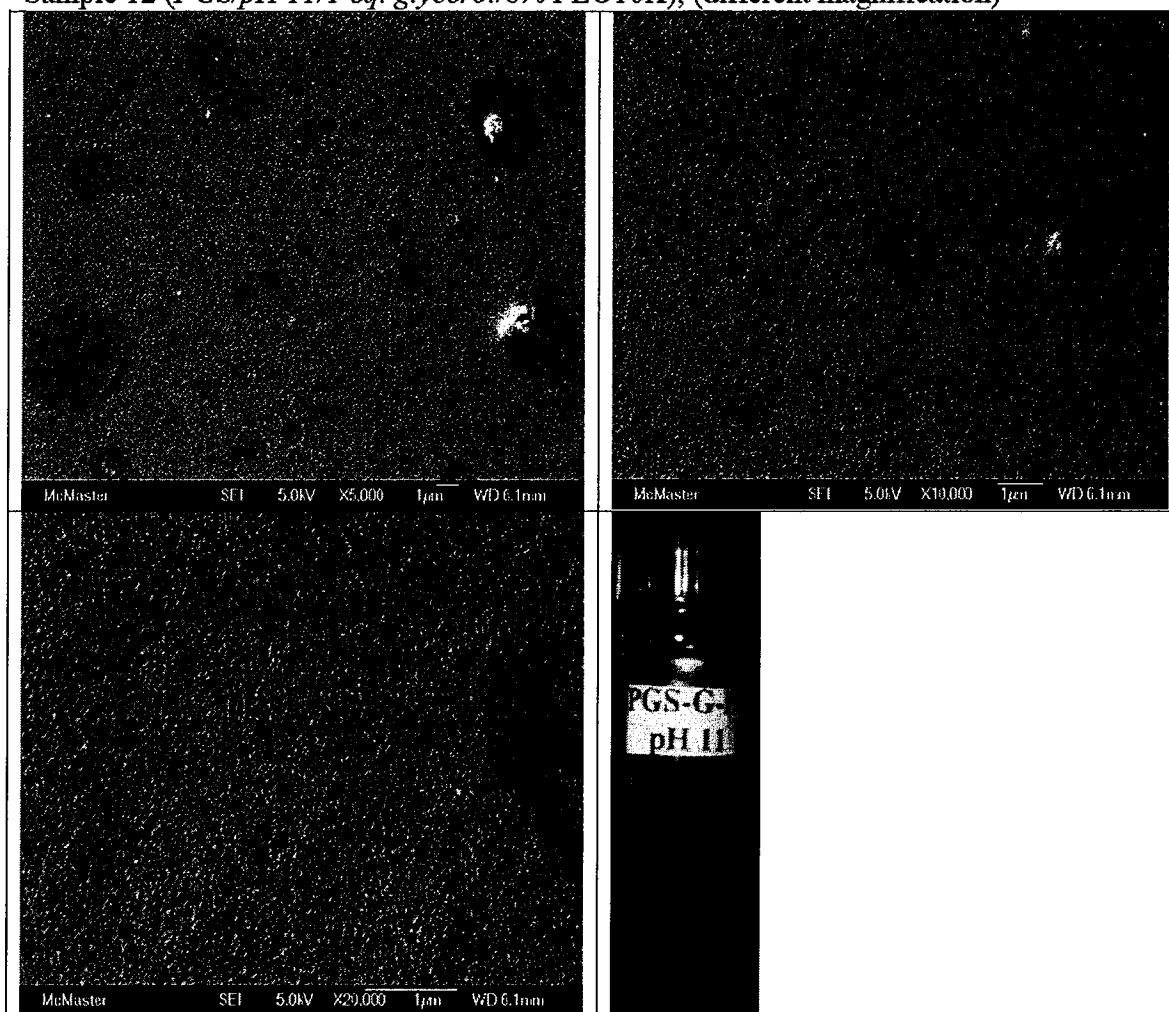
Sample 10 (*PGS/pH 11/8% PEO10K*), SEM (different magnification)



Sample 11 (*PGS/pH 5.5/1 eq. glycerol/8% PEO10K*), (different magnification)



Sample 12 (PGS/pH 11/1 eq. glycerol/8% PEO10K), (different magnification)



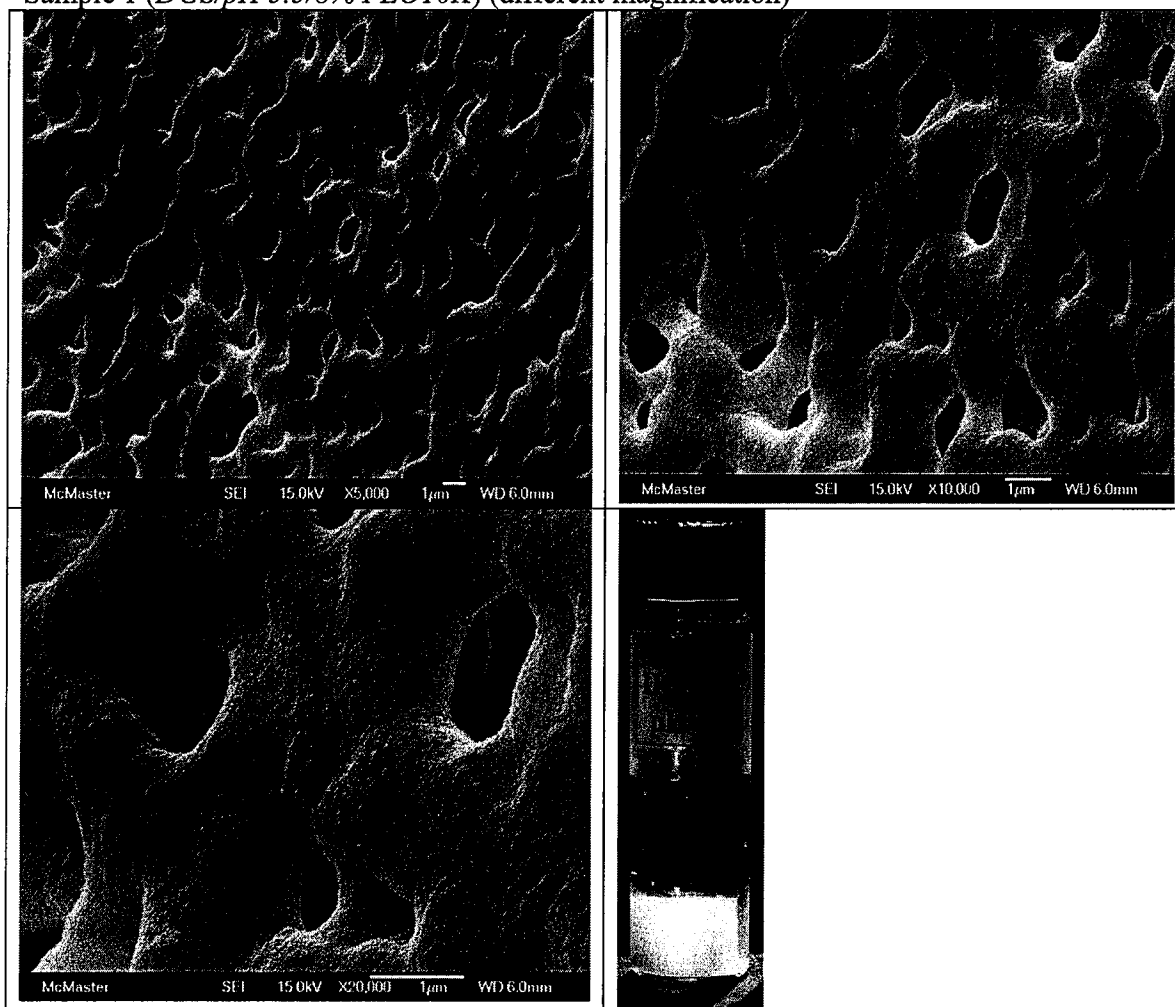
**Table 1. Reaction condition for preparation of silica monolith.**

Sample	DGS, g (mmol)	TEOS, g (mmol)	PGS G(mmol)	Additional glycerol g(mmol)	HEPES buffer (original 50mM), containing 16% w/v, PEO-10K	
					pH 5.5	pH 11
1	1.00 (4.71)				1 mL	
2	1.00 (4.71)					1 mL
3		0.98 (4.71)			1 mL	
4		0.98 (4.71)				1 mL
5	1.00 (4.71)			0.433(4.71)	1 mL	
6	1.00 (4.71)			0.433(4.71)		1 mL
7		0.98 (4.71)		0.433(4.71)	1 mL	
8		0.98 (4.71)		0.433(4.71)		1 mL
9			0.60 (4.71)		1 mL	

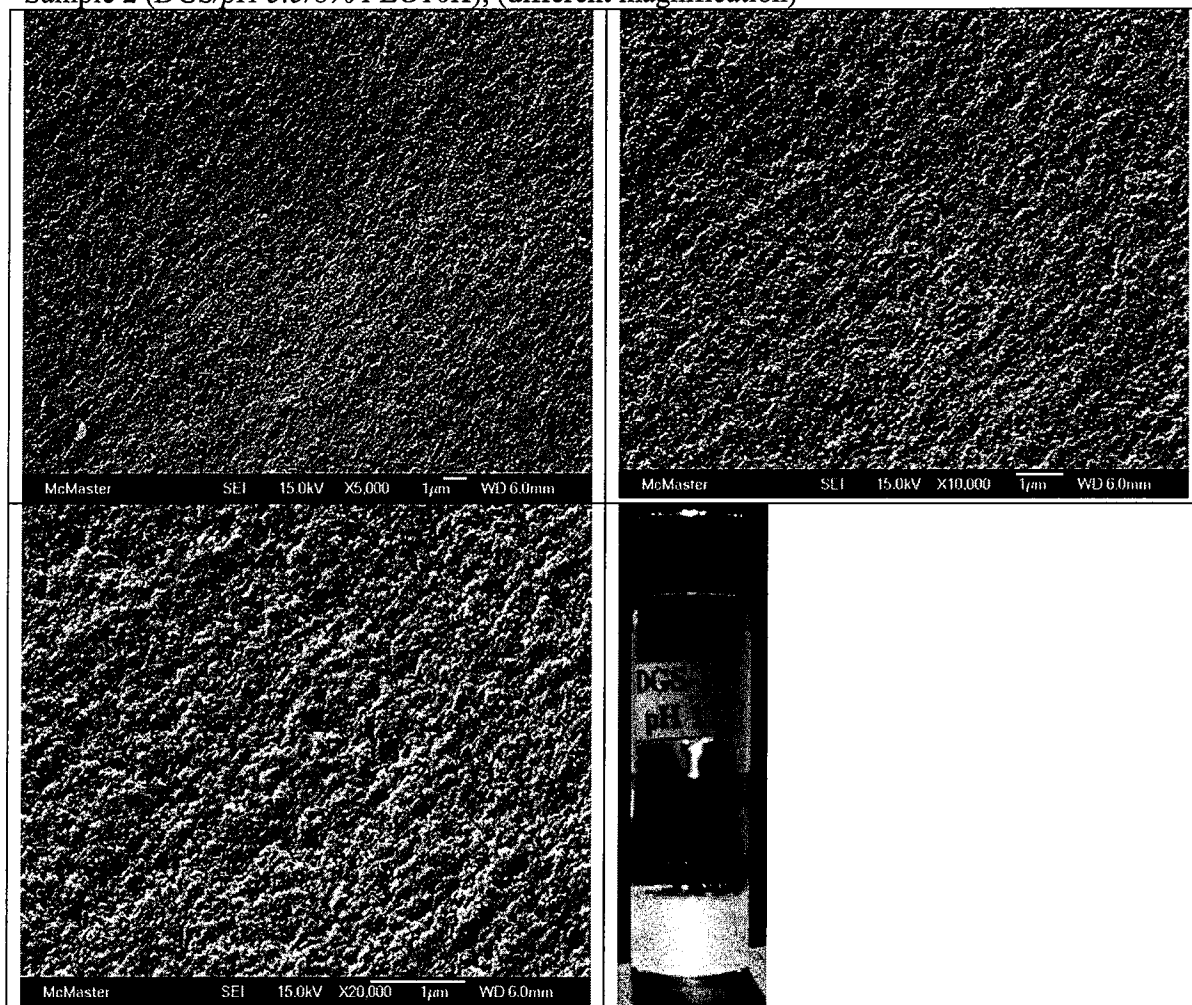
10			0.60 (4.71)			1 mL
11			0.60 (4.71)	0.433(4.71)	1 mL	
12			0.60 (4.71)	0.433(4.71)		1 mL

# SEM images

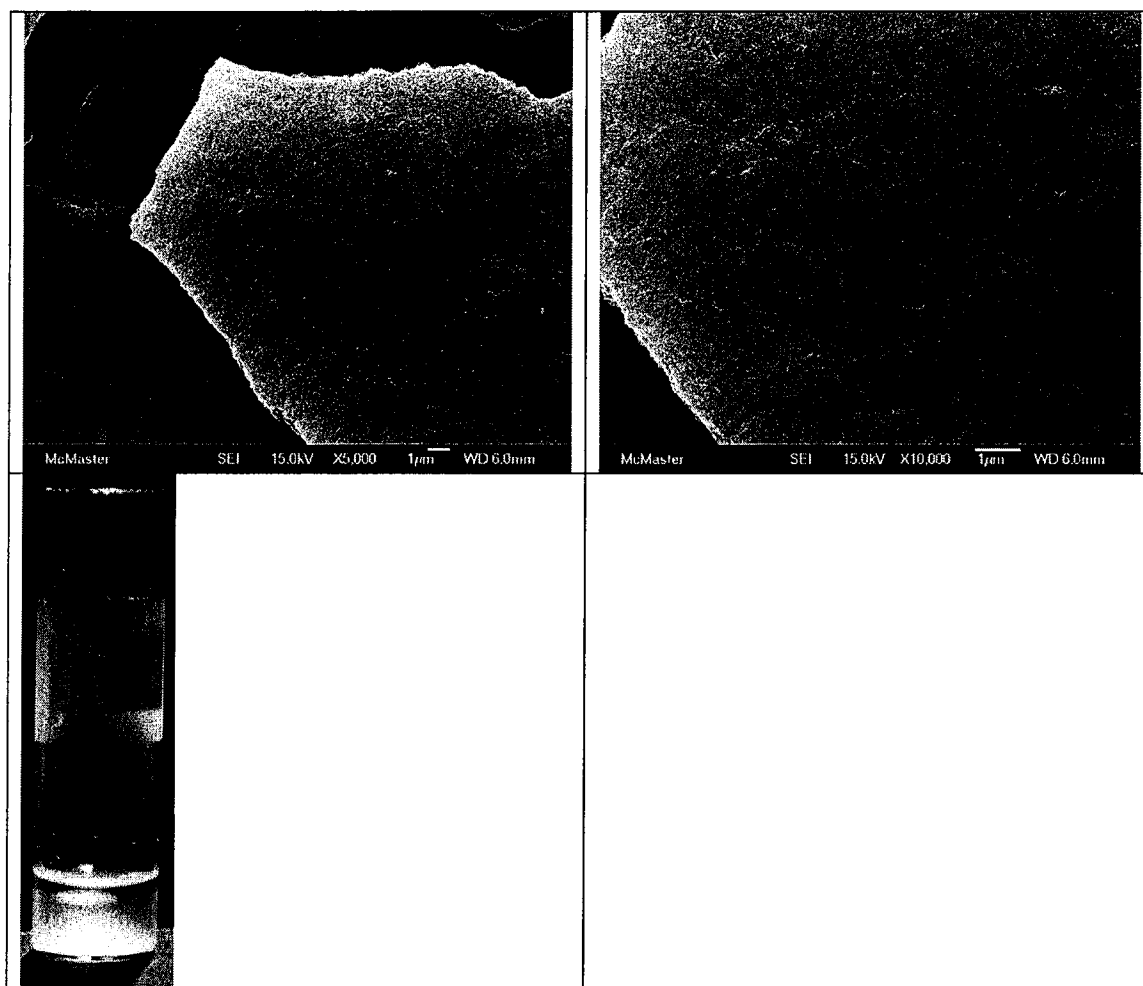
Sample 1 (*DGS/pH 5.5/8% PEO10K*) (different magnification)



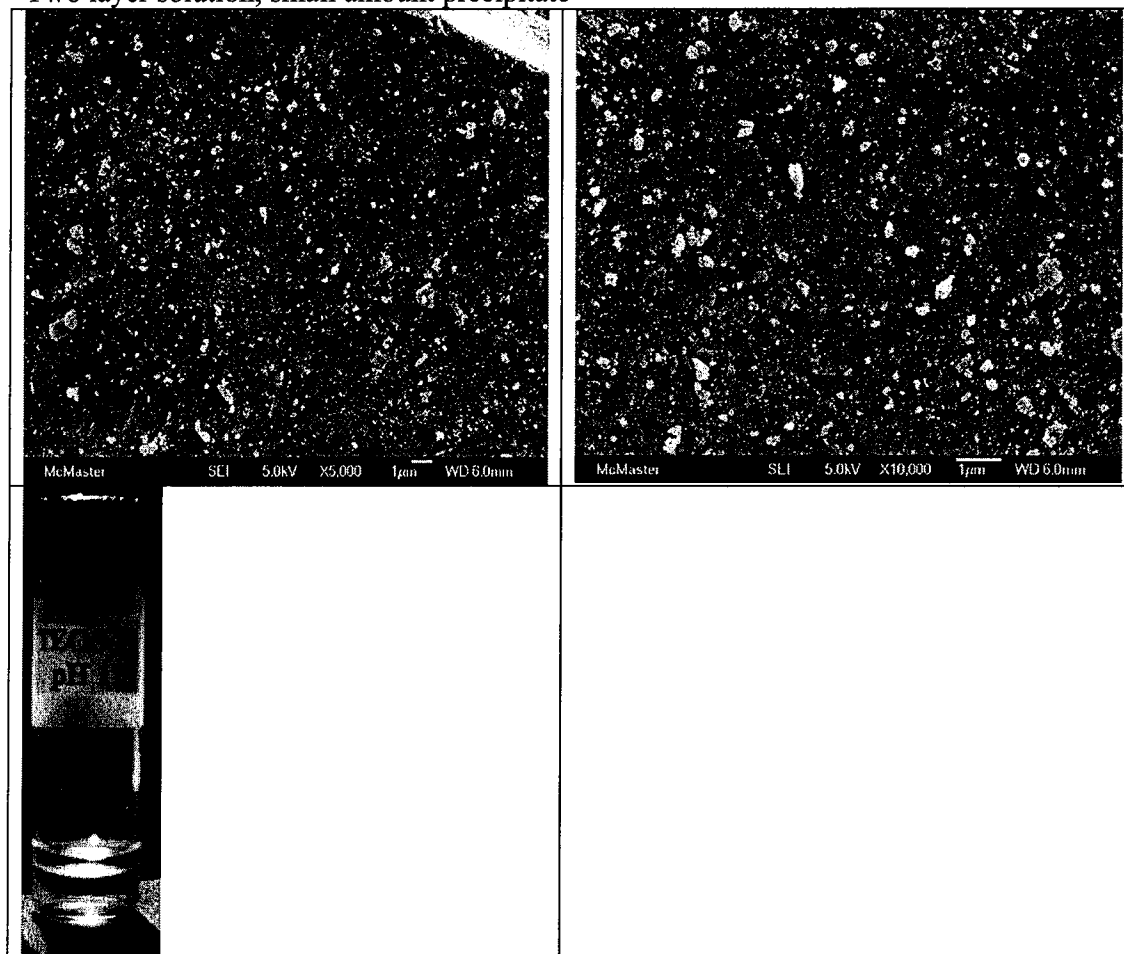
Sample 2 (*DGS/pH 5.5/8% PEO10K*), (different magnification)



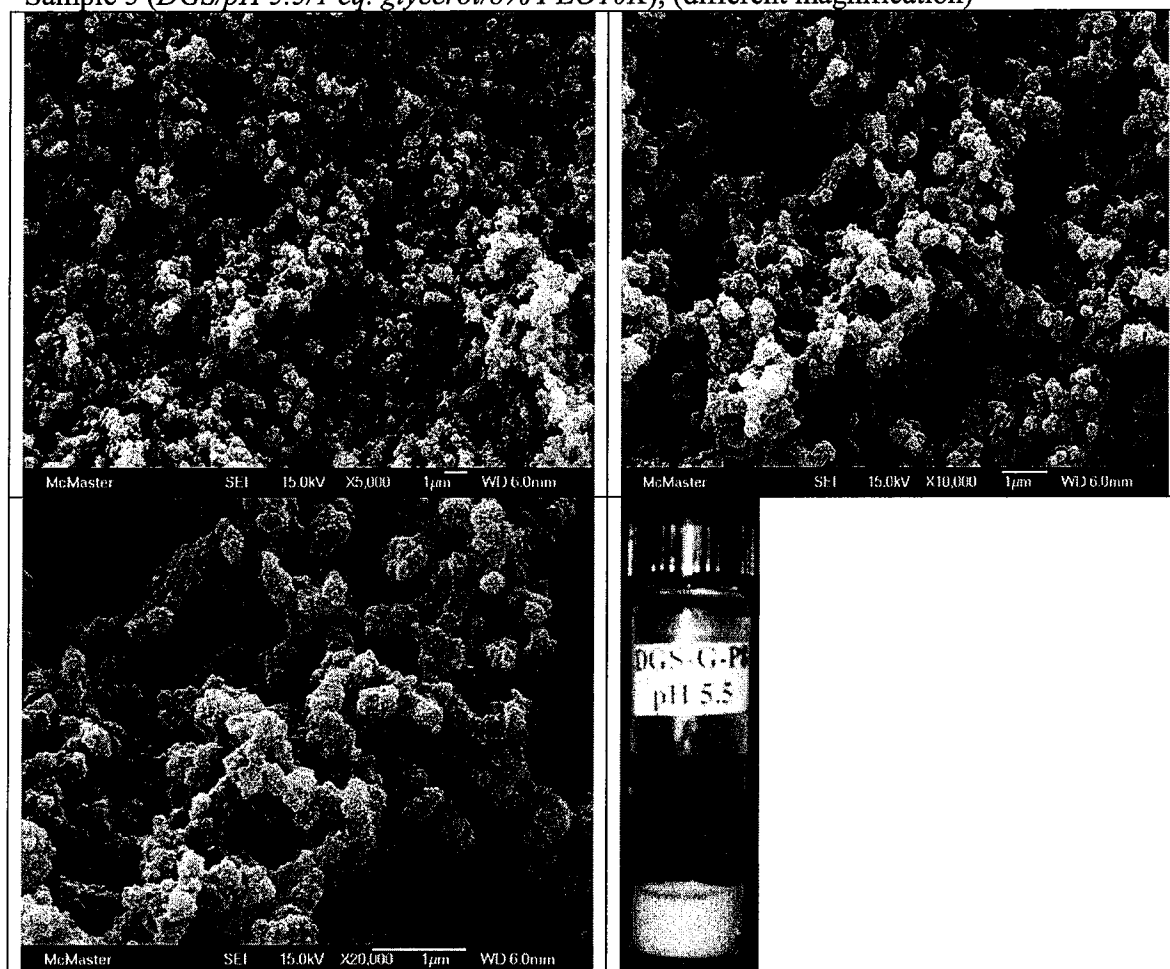
Sample 3 (*TEOS/pH 5.5/8% PEO10K*), (different magnification)  
Two layer solution, small amount precipitate



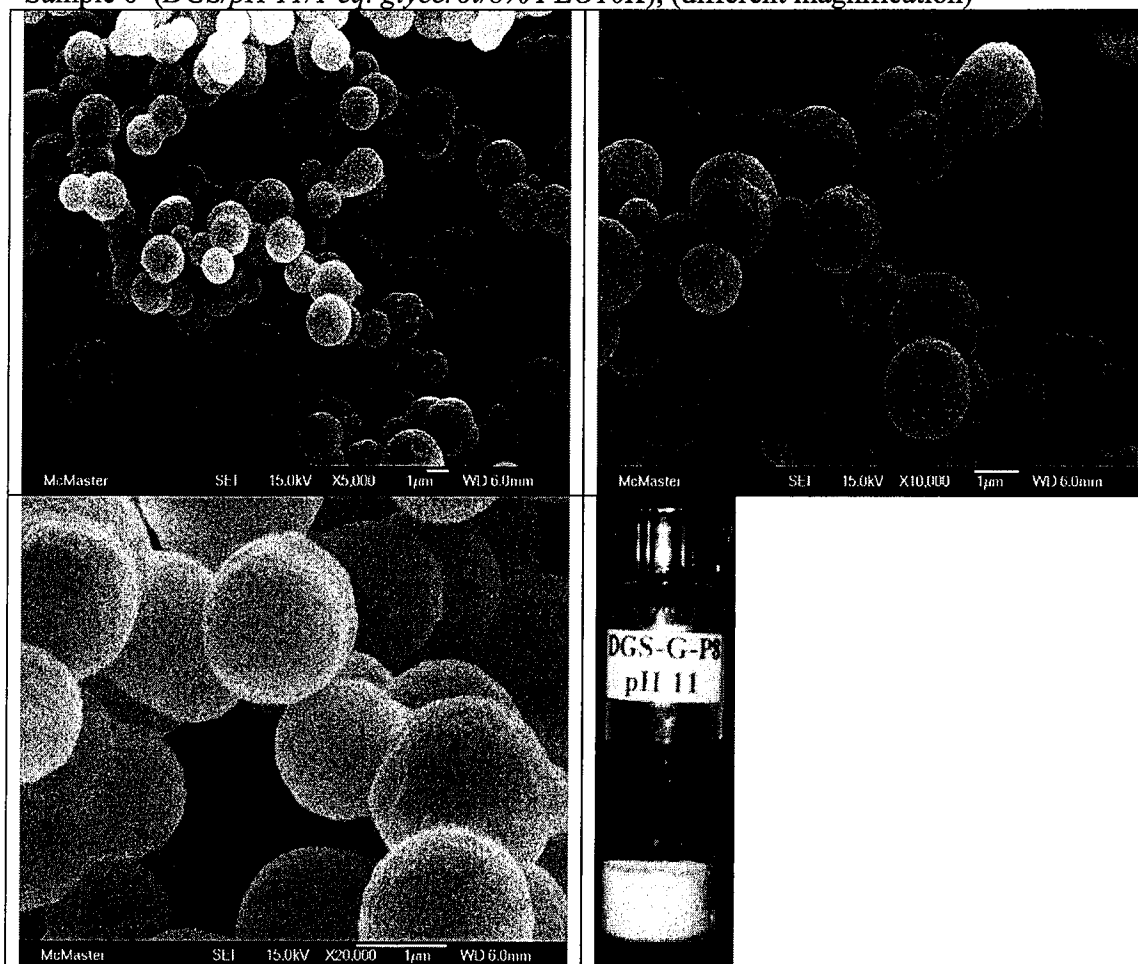
Sample 4 (TEOS/pH 11/8% PEO10K), (different magnification)  
Two layer solution, small amount precipitate



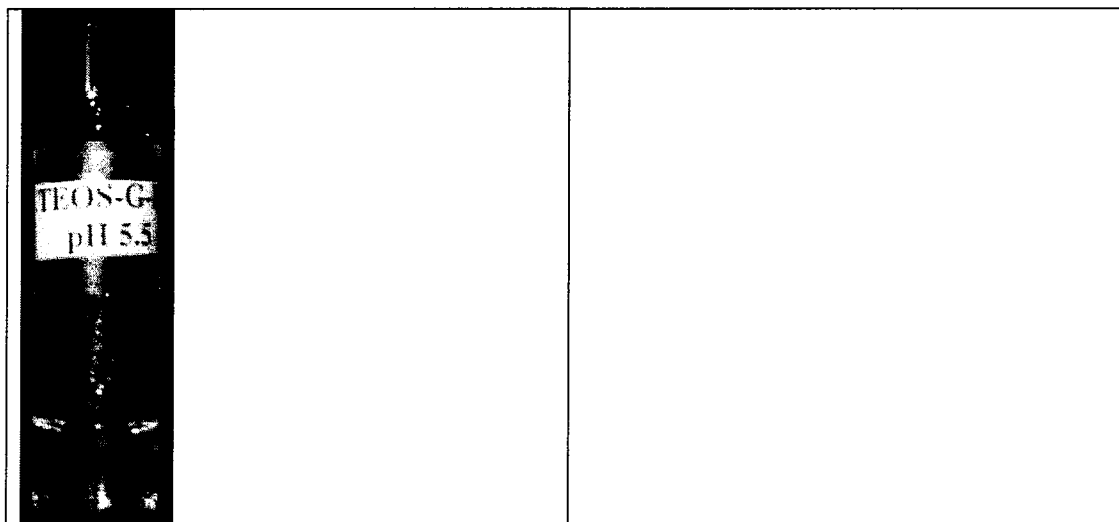
Sample 5 (DGS/pH 5.5/1 eq. glycerol/8% PEO10K), (different magnification)



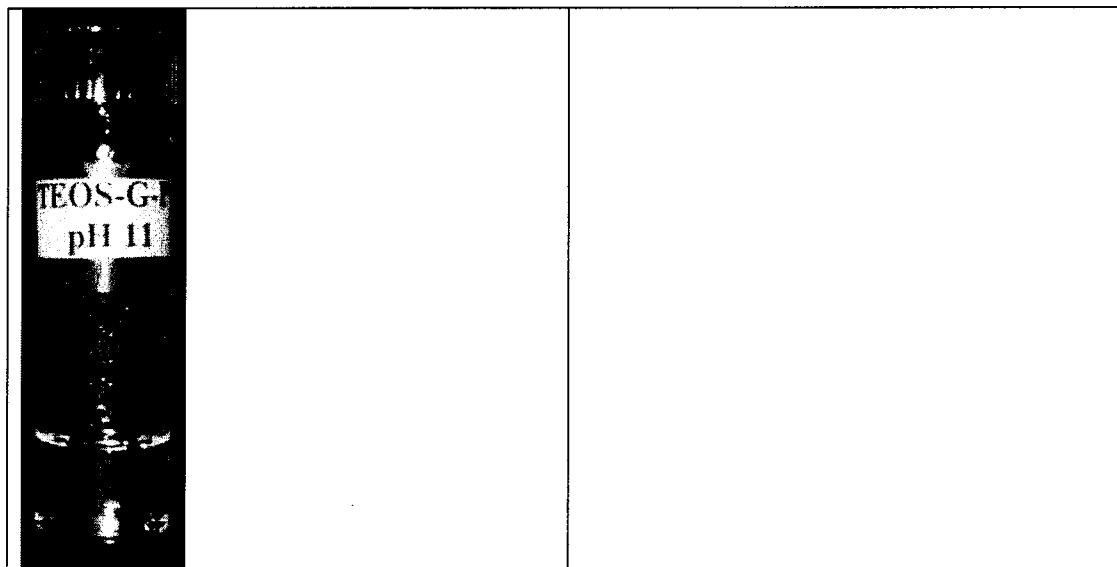
Sample 6 (*DGS/pH 11/1 eq. glycerol/8% PEO10K*), (different magnification)



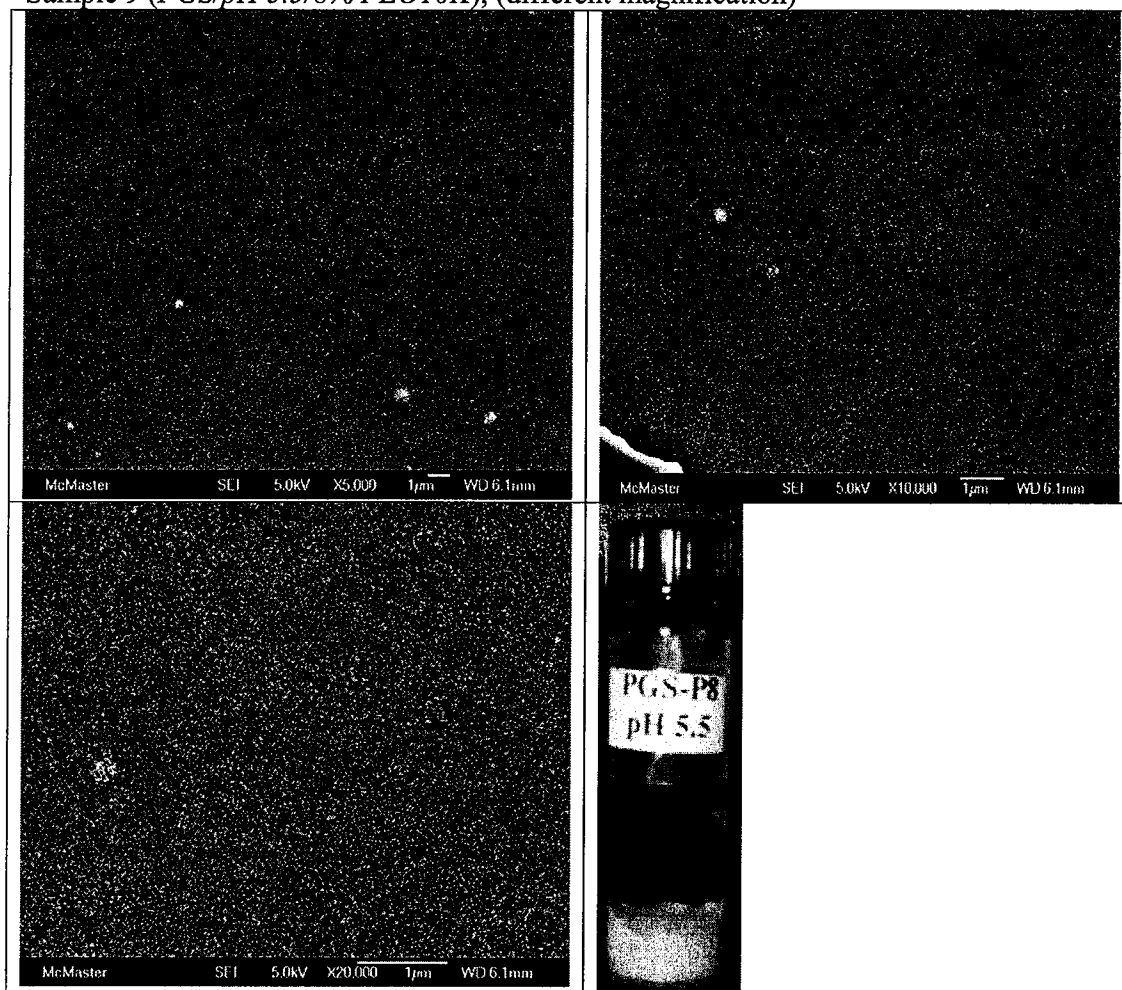
Sample 7 (*TEOS/pH 5.5/1 eq. glycerol/8% PEO10K*), Two layer solution, SEM is not available



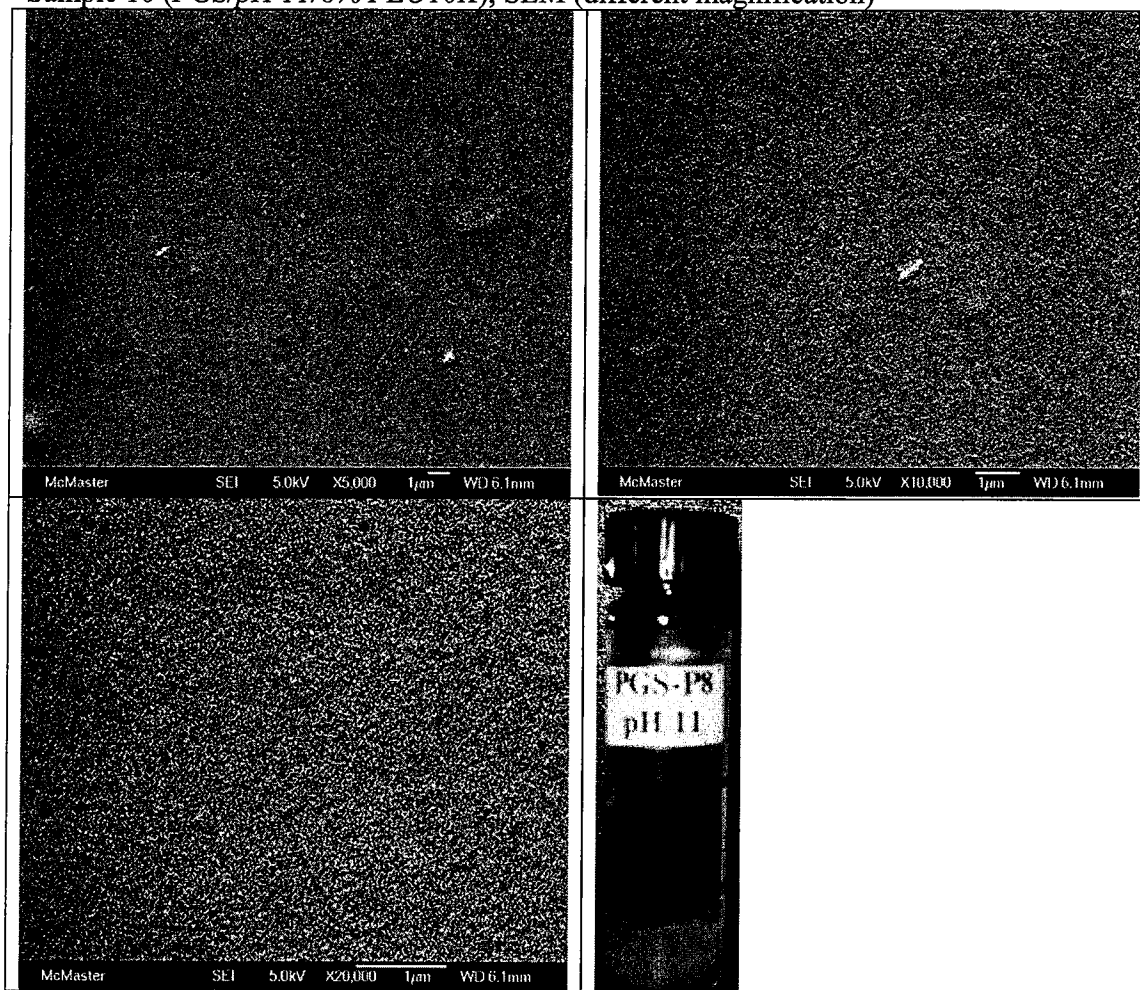
Sample 8 (*TEOS/pH 11/1 eq. glycerol/8% PEO10K*)  
Two layer solution, SEM not available



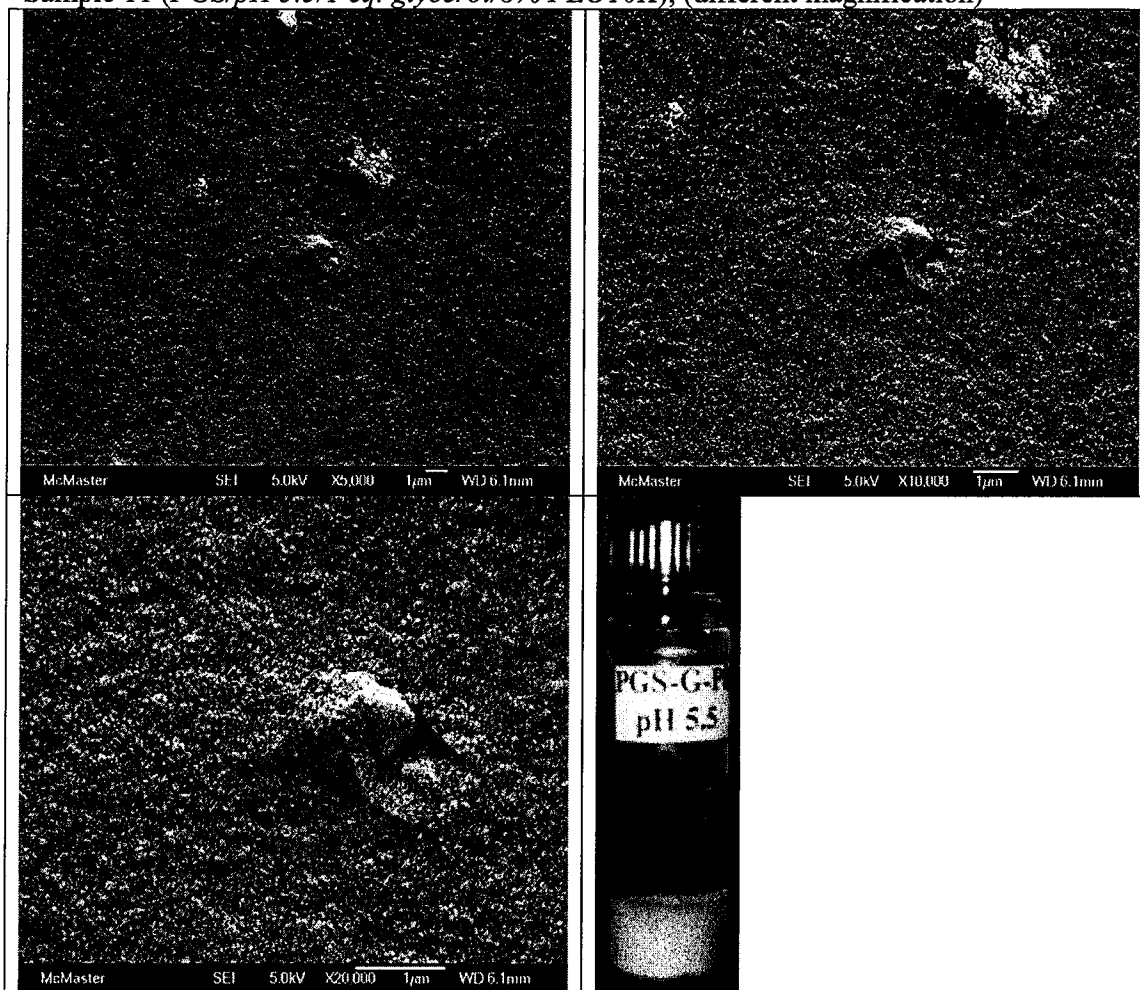
Sample 9 (PGS/pH 5.5/8% PEO10K), (different magnification)



Sample 10 (PGS/pH 11/8% PEO10K), SEM (different magnification)



Sample 11 (PGS/pH 5.5/1 eq. glycerol/8% PEO10K), (different magnification)



Sample 12 (PGS/pH 11/1 eq. glycerol/8% PEO10K), (different magnification)

